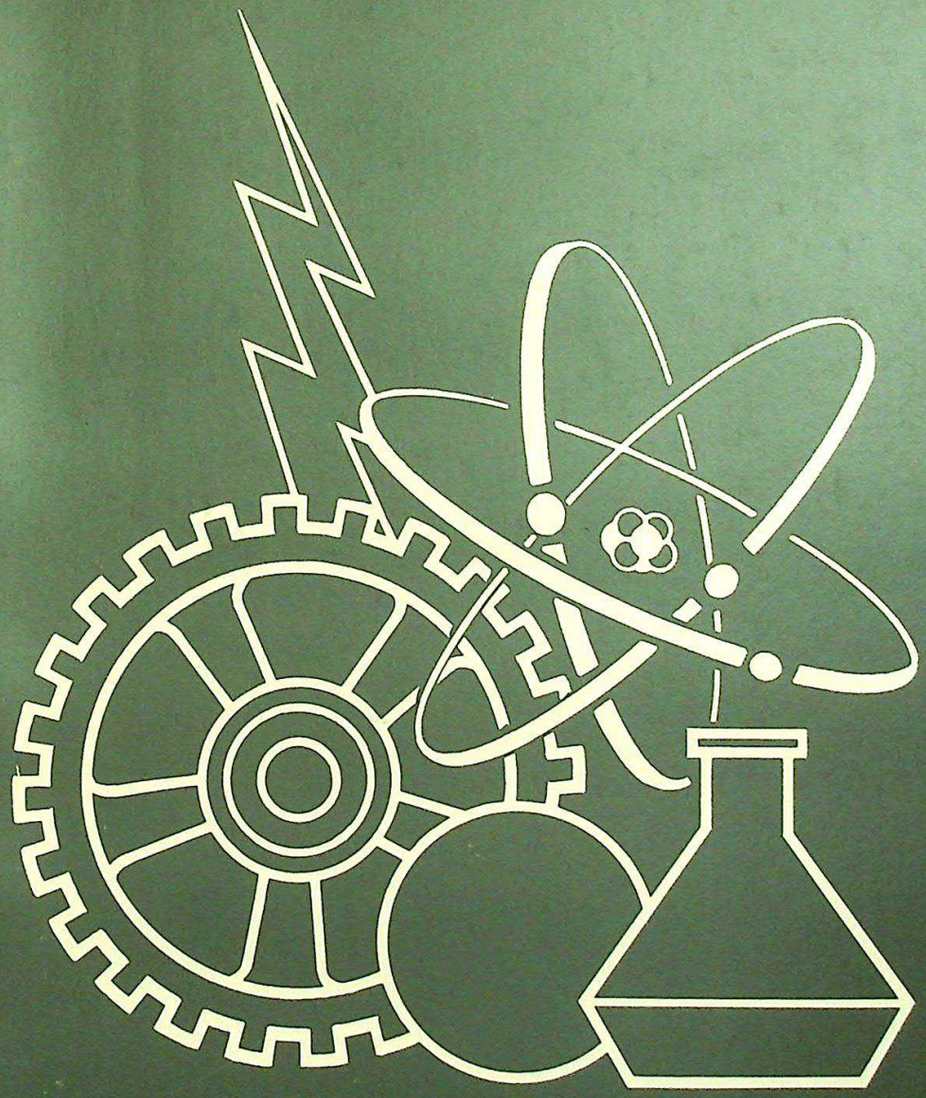
U.S. DEPARTMENT OF COMMERCE

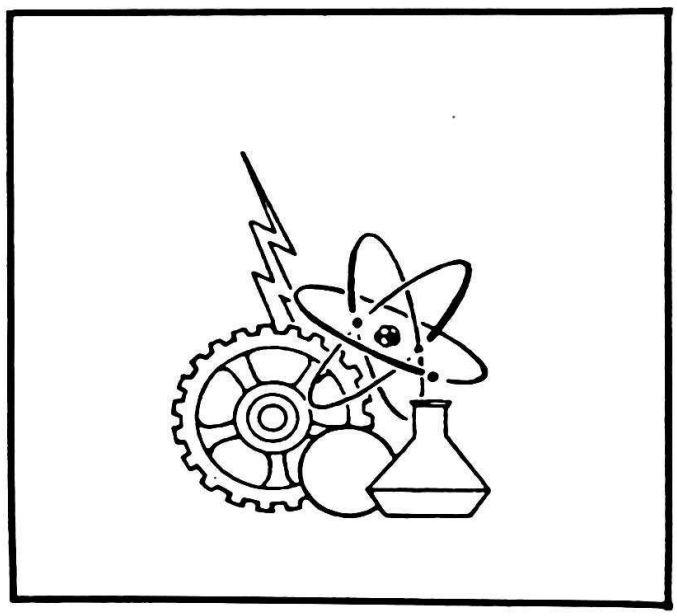
Patent and Trademark Office

PATENT PROFILES

TELECOMMUNICATIONS



PATENT PROFILES
TELECOMMUNICATIONS



a 1984 publication from the –
OFFICE OF TECHNOLOGY
ASSESSMENT AND FORECAST

U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige , Secretary

Patent and Trademark Office
Gerald J. Mossinghoff, Commissioner

Office of Technology Assessment and Forecast
John F. Terapane, Director

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Washington, D.C. 20402

PATENT PROFILES: TELECOMMUNICATIONS

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INTRODUCTION

Telecommunications is a large and growing industry in the United States. It is also a technology of high and increasing patent activity. Since 1963, the U.S. Patent and Trademark Office (PTO) has granted more than 48,000 U.S. patents disclosing Telecommunications technology. Each of these patents discloses one or more new and useful technological developments. Additionally, each discloses important characteristics of those developments, such as origin and ownership. This information can be used to assess the status and trends in this important technology. This publication examines Telecommunications activity and trends using data derived from Telecommunications patents granted since 1963.

Scope and Format of this Publication

Telecommunications patents included in this publication are those which disclose the transmission of information over a distance using electricity or electromagnetic waves. This broad technology is divided into seven major technology areas:

Telephony
Light Wave Communications
Multiplex Communications (Excluding Light Wave)
Analog Carrier Wave Communications
Digital and Pulse Communications
Television and Facsimile
Telemetry.

With the exception of Telemetry, each of these major areas is further subdivided. In total, 20 subdivisions are included.

The publication begins with an explanation of data, followed by a general analysis of U.S. patent activity in Telecommunications. The analysis summarizes, for Telecommunications as a whole and for each major area, patenting levels, patenting trends, origin and ownership characteristics. Following the analysis are in-depth profiles of each major area and subdivision of Telecommunications technology. These profiles show more detailed U.S. patent activity trends, present information about the origin and ownership of the patents, and include sample patents for each subdivision.

The report concludes with four Appendices. Appendix A contains explanatory notes and source data used in the general analysis. Appendix B describes publications of the Office of Technology Assessment and Forecast (OTAF). Appendix C describes the OTAF program and OTAF services available to the public. Appendix D identifies the principal contributors to this publication.

Additional Patent Data Available on Microfiche

A microfiche supplement to this publication contains the patent numbers of all patents included in this report, organized by technology area. Titles are given for all patents granted since 1969. Organizations

which are assigned patents are listed alphabetically, showing their patent numbers and titles. Other patents are grouped by name of inventor or individual assignee. For unassigned patents, the full address of each inventor is included. These microfiche are available from the National Technical Information Service (NTIS). See Appendix B for ordering information.

Using Patent Data

U.S. patents are an important source of information for assessing technological developments. Most significant developments are the subject of, or at least described in, the patent literature. Moreover, about 80% of the technology disclosed in U.S. patents is not disclosed in the nonpatent literature.* Finally, the value of patent data is enhanced by the rarity of quantitative technological indicators in time series going back to the very beginnings of the United States. Patents, perhaps, are the only such indicator.

Individual patents disclose substantial technical information. Collectively, patents also provide statistical information which can be used to assess and analyze technology trends. The advent of computerized data bases has made patent data more available to those who might want to use them.

In using patent data, however, certain characteristics of the data need to be considered. One of these is the variance between patents in importance and degree of invention. Another is the propensity to patent versus the propensity to seek alternative means of protection, such as lead time in the market place, copyrights and trade secrets. These factors, and others which may vary over time, within an industry and among industries, may well affect the use of, or conclusions drawn from, patent statistics.

Nevertheless, each patent represents to some degree a new piece of technology and some quantum of technological activity. Patent statistics, though imperfect, remain one of the best measures of the "who, what and where" of new technologies and technological activity.

Patents Included in the Profiles

Patent activity profiles are generated by first identifying key Patent and Trademark Office classifications, i.e., those entirely or substantially pertinent to the technology of interest. All the patents in these classifications are then included in the profile. This procedure results, in most cases, in the inclusion of the majority of patents relevant to the technology and few, if any, patents which are not relevant.

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* See the Eighth Report of the Office of Technology Assessment and Forecast, December 1977, pgs. 23-37.

EXPLANATION OF DATA AND FORMAT

Profiles of the patent activity in Telecommunications begin on page 27. The major technology areas of Telecommunications, with the exception of Telemetry, begin with a Patent Summary. The Patent Summary has four parts -- **Introduction, Activity Summary, Organizational Patenting** and **Patent Activity Tables.**

Patent Profiles of the 20 technology subdivisions and Telemetry (the major area which is not subdivided) contain six parts -- **Definition, Selected Patents, Activity Summary, Organizational Patenting, Patent Activity Tables** and **References Cited.** Two additional parts -- **Organizational Patenting - Alpha List** and **Inventors of Individually Owned Patents** -- appear in the microfiche supplement to this publication. Information in each part of a Patent Profile is highlighted and explained below.

Definition and Selected Patents. The first page of each Patent Profile defines the technology and describes the selected patents which are included as representative of the technology.

FIRST PAGE OF A PROFILE

2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

Scope of the Technology

DEFINITION

This profile includes different forms of optical fibers, waveguides or rods, and optical coupling and connecting devices. The optical coupling devices deliver light waves between optical structures and include lenses and prisms. The connecting devices join optical fibers or other optical elements. The particular compositions of the fibers such as the type of cores used are also included.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 2.2 are:

Description of representative patents

U.S. Patent 4,274,706. This patent describes a device which combines light beams of different wavelengths onto a single fiber or permits separate detectors to receive the beams. This invention is designed to be compact, inexpensive, and easily made.

U.S. Patent 4,317,614. This patent discloses a fiber optic data bus which transmits signals between master and slave terminals. The inventor claims that the system significantly reduces electronic hardware.

U.S. Patent 4,423,922. This patent discloses a directional coupler for optical communications systems. It provides a coupler which is easily manufactured, compact and which efficiently couples optical beams between a terminal and network.

U.S. Patent 4,329,017. This patent describes a module for coupling light from or to fibers. It also performs monitoring, splitting and switching functions. The monitoring function is desirable because it allows verification of module operation and determination of the fiber's integrity.

Front Pages of Selected Patents. The second and third pages of each Patent Profile show front pages of representative patents. The example below and the key which follows describe the data items which appear on the front page of a patent.

PATENT FRONT PAGE

United States Patent [19]

Krajewski

[11] **4,402,076**

[45] **Aug. 30, 1983**

[54] **TWO WIRE F.D. MULTIPLEX SYSTEM**

[75] Inventor: **Zdzislaw A. A. Krajewski, Ajax, Canada**

[73] Assignee: **Bayly Engineering Limited, Ajax, Canada**

[21] Appl. No.: **222,904**

[22] Filed: **Jan. 5, 1981**

[30] **Foreign Application Priority Data**

May 15, 1980 [CA] Canada 352009

[51] Int. Cl.³ H04L 5/14

[52] U.S. Cl. 370/30; 370/120

[58] Field of Search 370/69.1, 120, 30, 119

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,328,450 8/1943 Hagen 370/30

4,236,244 11/1980 Strehl 370/30

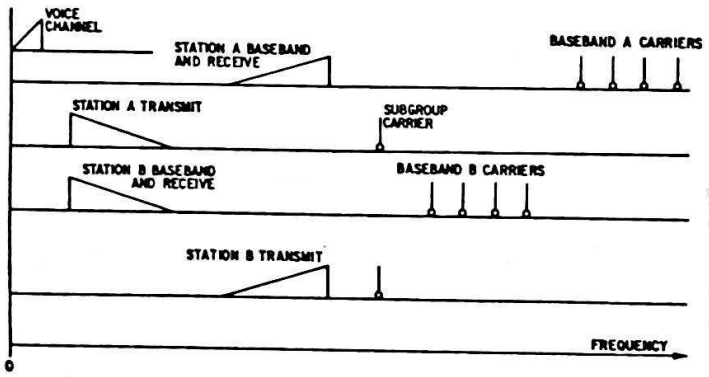
Primary Examiner—Glen R. Swann, III

Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A system comprises two kinds of multiplex stations connected by two wire lines and distinguished by two different predetermined frequency basebands each of which consists of predetermined frequencies for dividing the multiplex channels. The multiplex stations are provided with conversion means in their respective transmit paths so as to convert their own basebands to the different ones of the other multiplex stations connected and vice-versa. The system preferably provides generalized units in both kinds of multiplex stations and is simpler than a known one which uses the same basebands in all multiplex stations and converts the baseband before and after transmitting.

8 Claims, 9 Drawing Figures



KEY:

A - **PATENT NUMBER.** Each U.S. patent is assigned an unique, sequential number.

B - **ISSUE OR GRANT DATE.** The term of the patent (i.e., the length of time of patent protection) begins on the issue date.

C - **LAST NAME OF THE INVENTOR.** If there is more than one inventor, the inventor named first is listed here.

D - **TITLE.** The title describes the claimed invention.

E - **INVENTOR(S).** The front page shows the full name and residence (city and state or country) of each inventor. If the patent is unassigned, it shows the full address of each inventor.

E - **ASSIGNEE.** The assignee is the organization or individual to whom the inventor assigns the rights to the patent. The patent lists the city and state or country of the assignee.

F - **APPLICATION NUMBER AND DATE.** The PTO assigns each application a serial number and a filing date, which is the date the PTO received the application.

F - **FOREIGN APPLICATION PRIORITY DATA.** Applications which are filed in the United States may be entitled to the benefit of the filing date of a prior application in a foreign country. If the requirements for this benefit are met, then the front page of the patent will show the foreign country, and application date and number.

G - **CLASSIFICATION AND SEARCH INFORMATION.** "Int. Cl." indicates the International Patent Classification. "U.S. Cl." indicates the U.S. Patent Classification, i.e., the class/subclasses which contain copies of the patent. The "Field of Search" indicates the classes and subclasses where the Patent Examiner searched to compare the claimed invention to those in previous patents and publications.

H - **REFERENCES CITED.** The front page lists references which were cited by the Patent Examiner or the applicant to show the state of the art or to indicate the prior art most closely related to the invention claimed in the application.

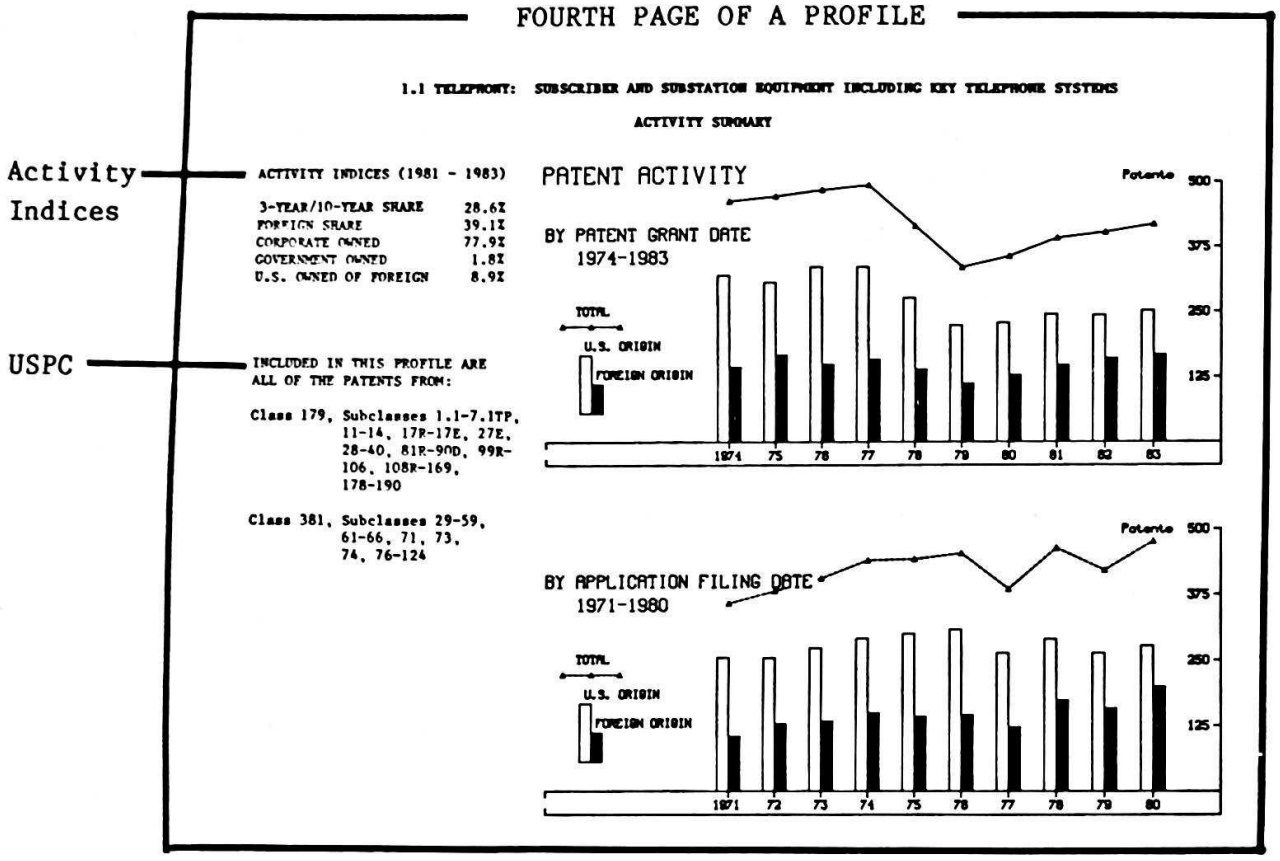
I - **EXAMINER AND ATTORNEY.** The front page includes the names of the Patent Examiner and the applicant's attorney.

J - **ABSTRACT.** The PTO requires that the patent application include a brief abstract of the technical disclosure. The purpose of the abstract is to enable the reader to determine quickly the nature of the technical disclosure.

K - **CLAIMS AND DRAWING FIGURES.** The front page shows the number of claims and drawing figures in the patent. When appropriate, the front page also includes a representative drawing of the patent.

Activity Summary. The fourth page of each Patent Profile shows trend plots by patent grant date and application filing date of these patents. It also shows activity indices (defined below) and the U.S. Patent Classifications (USPC) used to generate the patent information of the profile.

FOURTH PAGE OF A PROFILE



3-year/10-year Share - the number of patents issued in 1981-1983, divided by the patents issued in 1974-1983, multiplied by 100. (Average for all technologies = 28.2%.)

Foreign Share - the number of patents issued to residents of foreign countries in 1981-1983, divided by the total patents issued in 1981-1983, multiplied by 100. (Average for all technologies = 41.3%.)

Corporate Owned - the number of 1981-1983 patents assigned at time of issue to U.S. or foreign nongovernment organizations -- mainly corporations -- divided by the total number of patents issued in 1981-1983, multiplied by 100. (Average for all technologies = 77.4%.)

Government Owned - the number of 1981-1983 patents assigned at time of issue to the U.S. or a foreign government, divided by the total number of patents issued in 1981-1983, multiplied by 100. (Average for all technologies = 2.4%.)

U.S. Owned of Foreign - the number of 1981-1983 patents with a foreign resident inventor that are assigned to a U.S. organization, divided by the total number of 1981-1983 patents with a foreign resident inventor, multiplied by 100. (Average for all technologies = 7.2%.)

Organizational Patenting. The fifth page of each Patent Profile lists organizations (e.g., assignees*) ranked by the number of patents to which they held title at the time of the patent grant. The listing is limited by designation of a "cut-off" number (e.g., 11 or more patents). This list identifies the assignees who received the most patents in the profiled technology during the period 1969-1983. By far the largest portion of the assignees are corporations.

FIFTH PAGE OF A PROFILE

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

ORGANIZATIONS ASSIGNED 11 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
575	BELL TELEPHONE LABORATORIES, INC.
118	INTERNATIONAL STANDARD ELECTRIC CORP.
118	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
104	NORTHERN TELECOM LTD.
95	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
93	MOTOROLA INC.
91	U.S. PHILIPS CORP.
78	PIONEER ELECTRONIC CORP.
67	INTERNATIONAL BUSINESS MACHINES CORP.
62	SIEMENS AG.
57	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
53	SONY CORP.
51	STROMBERG-CARLSON CORP.
50	AKG AKUSTISCHE U. KINO-GERATE GMBH
49	NIPPON ELECTRIC CO., LTD.
47	UNITED STATES OF AMERICA, NAVY
45	GENERAL ELECTRIC CO.
45	TELEFONAKTIEBOLAGET LM ERICSSON
43	HITACHI, LTD.
33	TEXAS INSTRUMENTS, INC.
33	VICTOR CO. OF JAPAN, LTD.
32	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
31	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
31	XEROX CORP.
30	RCA CORP.
25	NIPPON GAKKI SEIZO K.K.
25	TOKYO SHIBAURA ELECTRIC CO., LTD.
25	WESTINGHOUSE ELECTRIC CORP.
23	UNITED STATES OF AMERICA, ARMY
21	AUTOMATIC ELECTRIC LABORATORIES INC.
20	GTE SYLVANIA INC.
20	SHARP K.K.
20	WESTERN ELECTRIC CO., INC.
18	ELECTRO-VOICE, INC.
17	IWATSU ELECTRIC CO., LTD.
17	THOMSON-CSF
17	ZENITH RADIO CORP.
16	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
16	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
16	T.A.D. AVANTI INC.
15	GENERAL ELECTRIC CO. LTD.
15	HARRIS CORP.
15	NIPPON COMMUNICATION INDUSTRIAL CO. LTD.
14	AUDICHRON CO.
14	CBS INC.
14	FORD AEROSPACE & COMMUNICATIONS CORP.
14	INDUSTRIAL RESEARCH PRODUCTS INC.
13	AMERICAN TELEPHONE AND TELEGRAPH INC.
13	MAGNAVOX CO.
13	POST OFFICE
12	BOSE CORP.
12	IWASAKI TSUSHINKI K.K.
11	OLYMPUS OPTICAL CO., LTD.
11	ALTEC CORP.
11	COMMUNICATIONS SATELLITE CORP.
11	KOSS CORP.
11	KUREHA KAGAKU KOGYO K.K.
11	MINNESOTA MINING AND MANUFACTURING CO.
11	RICOH CO., LTD.
11	ROCKWELL INTERNATIONAL CORP.
11	SUPERIOR CONTINENTAL CORP.
11	TEL-TONE CORP.

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* See definition in Appendix A.

Patent Activity Tables. The sixth and seventh pages of each Patent Profile show in tabular form the data relied upon in constructing the charts in the Activity Summary. The first table shows the yearly distribution of patents by the date of the patent grant, while the second table redistributes these data based on the application filing date of the patents. The usefulness of this latter data distribution is further explained in Appendix A.

SIXTH AND SEVENTH PAGES OF A PROFILE

1.1 TELEPHONY SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2002	345	359	382	406	440	442	453	385	463	421	476	258	31		6863
U.S. ORIGIN	1518	243	255	254	273	291	300	308	263	290	263	277	162	17		4714
FOREIGN ORIGIN	484	102	104	128	133	149	142	145	122	173	158	199	96	14		2149
JAPAN	82															
WEST GERMANY	87															
UNITED KINGDOM	64															
CANADA	50															
FRANCE	33															
SWEDEN	28															
NETHERLANDS	22															
AUSTRIA	36															
ITALY	17															
SWITZERLAND	15															
BELGIUM	14															
AUSTRALIA	9															
DENMARK	9															
U.S.S.R.	1															
NORWAY	3															
ARGENTINA	2															
ISRAEL	2															
CHINA(TAIWAN)																
CZECHOSLOVAKIA	4															
GREECE	1															
HUNGARY																
HONG KONG																
FINLAND																
S. AFRICA																
BRAZIL																
BULGARIA																
MEXICO	1															
LEBANON	1															
INDIA	1															
THAILAND																
CHINA P REP																
COLOMBIA																
CHILE																
COSTA RICA																
SOUTH KOREA																
OTHER(11)	4															
U.S. ORIGIN	1518															
U.S. CORP OWNED	1160															
U.S. GOVT OWNED	38															
U.S. INDIV OWNED	313															
FOREIGN OWNED	7															
FOREIGN ORIGIN	484															
U.S. OWNED	143															
FOREIGN OWNED	341															
FOREIGN CORP	274															
FOREIGN GOVT	4															
FOREIGN INDIV	63															

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2187	388	472	397	375	465	474	486	495	416	336	357	392	403	418	8061
U.S. ORIGIN	1728	302	329	268	273	321	307	337	337	277	224	229	245	243	251	5671
FOREIGN ORIGIN	459	86	143	129	102	144	167	149	158	139	112	128	147	160	167	2390
JAPAN	52	14	27	38	33	50	82	56	57	51	46	55	62	76	93	792
WEST GERMANY	85	18	20	14	8	13	11	18	17	10	11	13	15	12	16	282
UNITED KINGDOM	76	11	23	19	8	18	20	12	20	16	13	11	8	12	9	276
CANADA	33	12	17	16	20	22	18	15	11	21	9	12	15	18	9	248
FRANCE	31	3	13	9	13	9	10	10	9	8	11	17	12	10	5	171
SWEDEN	45	7	3	9	5	5	6	6	3	11	3	4	5	3	3	118
NETHERLANDS	27	4	4	5	3	8	3	6	8	5	3	4	3	8	16	107
AUSTRIA	36	5	13	8	3	2	4	1	3	3	5	2	3	3	1	92
ITALY	15	3	8	3	2	3	2	10	7	1	4	5	5	9	6	83
SWITZERLAND	14	3	5	2	1	2	4	6	7	7	4	2	6	2		65
BELGIUM	13	2	3	2			1	2		2				1		26
AUSTRALIA	4				1			1	2	1			4	1	1	15
DENMARK	4			1	1			1	3		2				1	13
U.S.S.R.						3			4	1		2				10
NORWAY	2		1	1				2	1		1					8
ARGENTINA	1		1			2			1						3	8
ISRAEL	1		2				1						2		1	7
CHINA(TAIWAN)							1	1					3	1	1	7
CZECHOSLOVAKIA	1	1	2				1									5
GREECE		1			1	2								1		5
HUNGARY						1	1		2							4
HONG KONG													3	1		4
FINLAND						2			1							3
S. AFRICA	2						1									3
BRAZIL							1	1	1							3
BULGARIA													1		1	2
MEXICO	1	1														2
LEBANON	1	1														2
INDIA	1			1												2
THAILAND															1	1
CHINA P REP						1										1
COLOMBIA										1						1
CHILE												1				1
COSTA RICA	1															1
SOUTH KOREA														1		1
OTHER(11)	3		1	1	2	1		1	1					1		11
U.S. ORIGIN	1728	302	329	268	273	321	307	337	337	277	224	229	245	243	251	5671
U.S. CORP OWNED	1286	231	252	202	201	223	207	240	249	186	153	156	170	164	191	4111
U.S. GOVT. OWNED	27	5	11	4	7	6	14	8	5	2	6	8	4	4	5	116
U.S. INDIV OWNED	412	65	62	58	64	88	82	88	82	85	64	63	65	71	54	1404
FOREIGN OWNED	3	1	4	4	1	3	4	1	1	4	1	2	6	4	1	40
FOREIGN ORIGIN	459	86	143	129	102	144	167	149	158	139	112	128	147	160	167	2390
U.S. OWNED	122	25	39	25	13	27	20	25	15	16	5	21	9	16	17	395
FOREIGN OWNED	337	61	104	104	89	117	147	124	143	123	107	107	138	144	150	1995
FOREIGN CORP	253	48	86	84	76	92	127	102	115	102	91	86	112	128	128	1630
FOREIGN GOVT	5		3			1	1	1		3	1	4	4	4	1	28
FOREIGN INDIV.	79	13	15	20	13	24	19	21	28	18	15	17	22	12	21	337

References Cited. The eighth page of each Patent Profile provides information about the references which were cited during the examination period of patents which issued in the technology between 1975 and 1983. This information may indicate the countries, corporations and patents which dominate the technological area. Citations may be U.S. patents, foreign patents, or nonpatent (literature) references, and the number of each is listed.

"Country of Origin of U.S. Patent References Cited" shows the residence countries of the inventors of the U.S. patent references cited. This information relates only to U.S. patent references with grant dates since 1963.

"Most Frequently Cited U.S. Patents, Assignee" shows U.S. patents cited most often as references in the technology, the assignee and the number of times the patent was cited. Frequently cited patents may be more important than those less frequently cited.

"Most Frequently Cited Assignees" shows the five assignees whose patents were cited most often as references during the examination period of the patents which issued in the subject area. The "Number of Citations" reflects each time the assignee was cited. Assignee information applies to U.S. patent references with grant dates since 1969.

EIGHTH PAGE OF A PROFILE

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT
INCLUDING KEY TELEPHONE SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	3777
TOTAL REFERENCES CITED	22133
U.S. Patent References Cited	19192
Foreign Patent References Cited	1685
Other References Cited	1256

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	11617
Japan	1465
Canada	565
United Kingdom	547
West Germany	404

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,932,709, General Teletronics Inc.	26
3,760,121, Electronics Arrays, Inc.	21
3,641,496, Phonplex Corp.	21
3,790,720, Northern Telecom Ltd.	20
3,843,845, Northern Telecom Ltd.	19

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	1470
GTE Automatic Electric Laboratories, Inc.	300
International Standard Electric Corp.	244
International Telephone & Telegraph Corp.	234
Northern Telecom Ltd.	228

*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

Additional Patent Data Available on Microfiche. A microfiche supplement to this publication can be obtained from the National Technical Information Service. (See Appendix B for ordering information.) It contains the patent numbers of all patents included in this publication, organized by technology area. Within each area, patents are grouped by organizational assignee or by inventor name if unassigned or assigned to an individual. Titles for all patents granted since 1969 are included.

"Organizational Patenting - Alpha Listing" shows 1969-1983 patents assigned to organizations, arranged alphabetically. This listing provides valuable information to potential entrepreneurs, competitors and those in need of technological know-how by identifying corporate actors in the field. Patent titles help to identify the subject matter of the patent.

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

ORGANIZATIONAL PATENTING (1/69-12/83) - - ALPHA LISTING

AUTOMATION ELECTRONICS CORPORATION
4066847 - AUTOMATIC CALL ANSWERING AND SEQUENCING SYSTEM

AUTOPHON AKTIENGESELLSCHAFT
3622885 - SYSTEM FOR THE PARALLEL TRANSMISSION OF SIGNALS
4092600 - INSTALLATION FOR TWO-WAY RADIO COMMUNICATION

AVCO CORPORATION
3538253 - SIGNAL POWERED SIGNAL-TO-NOISE SQUELCH
3757236 - BAND PASS FILTER AND DETECTION CIRCUIT
3876836 - REMOTE CONTROL SYSTEM UTILIZING TELEPHONE RINGS AS ORDERS
3924194 - SIGNAL REGENERATOR

BABBCO, LTD.
3953675 - AUDIO SPEAKER SYSTEM
3983337 - BROAD-BAND ACOUSTIC SPEAKER
4115667 - LOUDSPEAKER VOICE COIL BEARING
4144416 - UNITARY TUNED PORT AND LOUDSPEAKER FRAME
4205205 - DYNAMIC LOUDSPEAKER HAVING MAGNETIC ASSEMBLY ADHESIVELY BONDED
4225756 - BROAD BAND DYNAMIC LOUDSPEAKER
4225757 - BROAD BAND DYNAMIC LOUDSPEAKER

BACH LABORATORIES, INC.
4230012 - MUSICAL INSTRUMENT AND METHOD FOR USE THEREIN

BADGER METER, INC.
4004097 - AUTOMATIC METER READING DEVICE
4346263 - SIGNALLING ARRANGEMENT FOR TELEPHONE EQUIPMENT

"Inventors of Individually Owned Patents" shows each inventor's name, full address, the patent numbers and titles for unassigned 1975-1983 patents; and each inventor's name, city and state, the patent numbers and titles for patents assigned to individuals. This information facilitates identification of the apparently unaffiliated or "independent inventor" participants in the technology.

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

INVENTORS OF INDIVIDUALLY OWNED PATENTS (1/75-12/83)

INVENTOR NAME			STREET	
AARDE	KENNETH	T.	22747 ALICE ST.	
4310730 - SHIELDED PIEZOELECTRIC ACOUSTIC PICKUP FOR MOUNTING ON MUSICAL INSTRUMENT				
ABEND	IRVING	J.	17 CLINTON PARK DR.	
4266094 - ELECTRONIC SPEECH PROCESSING SYSTEM				
ACKS	ROBERT	S.	3369 KEARNY VILLA RD.	
3863027 - HYDROSONIC DIVING COMMUNICATION AMPLIFIER SYSTEM				
ADDOO	MARIE		135-01 234TH ST.	
4057697 - TELEPHONE DIAL LOCK				
ADELMAN	ROGER	A.		
4419544 - SIGNAL PROCESSING APPARATUS				
AHAMED	SYED	V.	743 DAVIS RD.	
4316061 - MINIMAL DELAY RATE-CHANGE CIRCUITS				
AHRENS	WALTER	C.	3228 S. 128TH AVE.	
4250531 - SWITCH-ARC PREVENTING CIRCUIT				
ALOUPIS	HARRY		515 N. POLLARD ST.	
4025734 - AMBIENT NOISE SHIELDED EAR TRANSCEIVER				
ALVIS	ROYAL	F.		
3995121 - TELEPHONE INTERCONNECTED PAGING SYSTEM WITH DIAL CLICK TO PULSE CONVERTER				
ANDERSON	JAMES	C.	1 MOHEGAN RD.	
4271332 - SPEECH SIGNAL A/D CONVERTER USING AN INSTANTANEOUSLY-VARIABLE BANDWIDTH FILTER				
ASHTON	THOMAS	A	9659 CYPRESS AVE.	
4081630 - TELEPHONE DISABLING DEVICE				

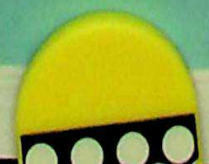
Also shown is a list of those patents (1963-1983) with neither assignment nor inventor information in the data base. Essentially, this encompasses all patents in the period 1963-1968, and unassigned patents from 1969 through 1974.

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

PATENTS (1/63-12/83) WITH NEITHER ASSIGNMENT NOR INVENTOR INFORMATION

3668335 - ELECTROSTATIC LOUDSPEAKER
3668526 - COMMUNICATION SYSTEM HAVING MEANS FOR CAUSING A DISTRESS SIGNAL
3670107 - WORD AND LETTER SPACING ARRANGEMENT FOR HUMAN-SPEECH TYPEWRITERS
3673343 - ANTI-JAMMING CIRCUIT FOR MULTI-FREQUENCY SIGNAL DETECTOR
3673344 - HEAD POSITIONING MECHANISM FOR RECORDED ANNOUNCEMENT APPARATUS
3673487 - UNDERGROUND RADIO COMMUNICATION SYSTEM FOR ROADWAYS
3673783 - DIRECT CHARGE-RATE INDICATOR
3674939 - BASEBAND PULSE CODE MODULATION SYSTEM
3674941 - CALL-NUMBER MONITORS FOR TELEPHONES
3676594 - SOUND DISPENSER
3678201 - BANDWIDTH COMPRESSION SYSTEM IN PHONETIC SOUND SPECTRUM
3678202 - LOUDSPEAKER BALANCING SYSTEM
3678416 - DYNAMIC NOISE FILTER HAVING MEANS FOR VARYING CUTOFF POINT
3679830 - COHESIVE ZONE BOUNDARY DETECTOR
3679833 - LOUDSPEAKER SYSTEM
3679837 - INTERCOMMUNICATION SYSTEM
3679845 - LIGHTING UNIT INCORPORATING LOUDSPEAKERS
3681535 - SETTABLE AUTOMATIC CALL REPERTORY DEVICE WITH CONTROL OF DIAL, PUSHBUTTON
3683114 - AUTOMATIC DIALING AND MESSAGE REPORTING SYSTEM
3683121 - INDICATING APPARATUS
3684052 - SUSPENSION FOR LOUDSPEAKER
3686444 - TELEPHONE INSTRUMENTS

ANALYSIS OF U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS



ANALYSIS OF U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS

Introduction

This section presents an analysis of recent activity and trends in the number, origin, and ownership of U.S. Telecommunications patents. It analyzes the activity in Telecommunications as a whole, compares the seven major areas into which the technology is divided, and discusses activity in 20 additional subdivisions of Telecommunications.

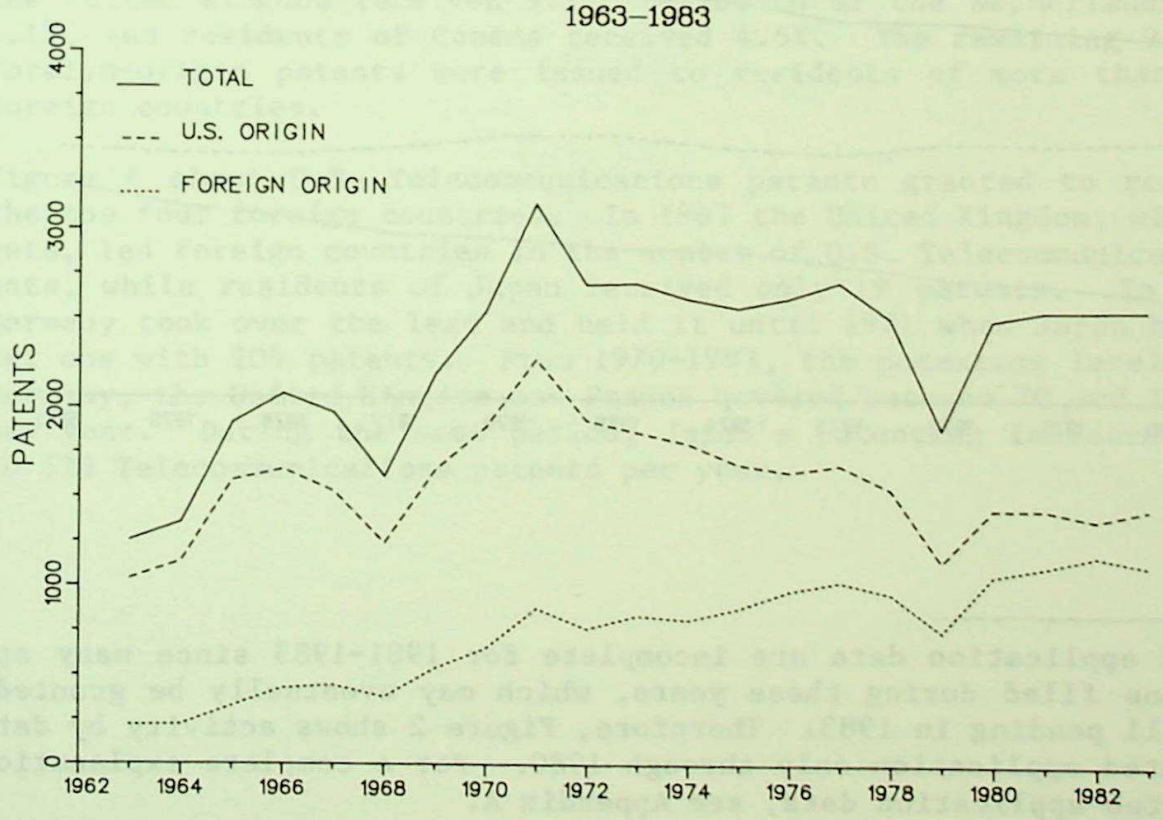
The statistical data supporting the Figures in this section appear in tabular form in Appendix A.

Patent Grants Per Year

Figure 1 displays the number of U.S. Telecommunications patents granted each year from 1963-1983, and the number granted to U.S. and foreign residents. The most activity occurred in 1971 when the PTO granted 3,141 Telecommunications patents. Figure 1 shows that, on the basis of patent grant data, the total patenting in Telecommunications generally increased from 1963 to 1971, and then maintained a plateau from 1972 to 1983, except for a decrease in 1979.

FIGURE 1

U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS
BY YEAR OF PATENT GRANT
1963–1983



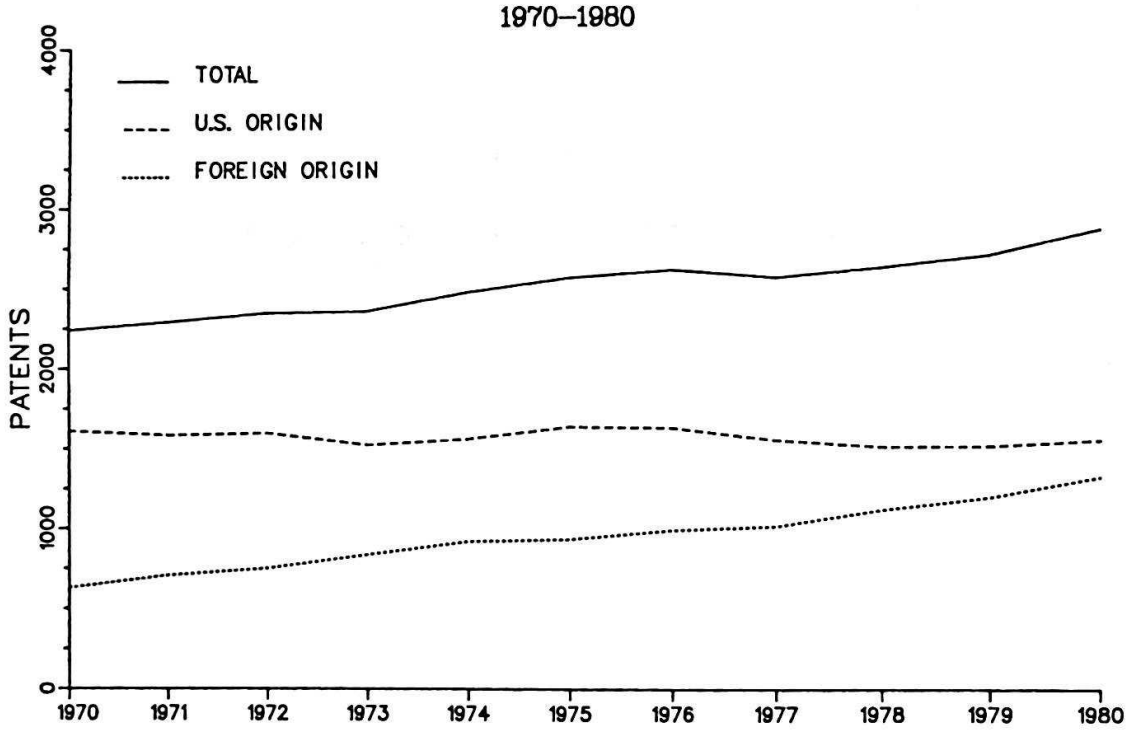
The sharp drop in 1979 that appears in this figure and others in this publication is not due to an abrupt change in patent filing activity. It occurred because the PTO granted substantially fewer patents than normal that year due to a lack of funds to print patents.

Figure 1 also shows that the proportion of foreign-origin patents in Telecommunications is increasing. In 1970, 25.6% of the U.S. Telecommunications patents were of foreign origin, as compared to 43.8% in 1983. This increase in foreign-origin patents is slightly larger than that for all technologies combined, which increased from 26.9% in 1970 to 42.2% in 1983.

Figure 2 shows patenting activity by year of application filing of Telecommunications patents. Patent data distributed by application filing date hereafter are referred to as patented application data.* Analyzing the number of patents granted in terms of the year in which the applica-

FIGURE 2

U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS
BY YEAR OF PATENTED APPLICATION
1970–1980



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* Patented application data are incomplete for 1981-1983 since many applications filed during these years, which may eventually be granted, were still pending in 1983. Therefore, Figure 2 shows activity by date of patented application only through 1980. For a complete explanation of patented application data, see Appendix A.

tion was filed more accurately reflects the time when the invention was developed. Also, unlike grant data, patented application data are not affected by internal PTO processing conditions.

Figure 2 shows that overall patenting in Telecommunications increased steadily over the period, and that this increase is due to the increase in foreign-origin patenting. U.S.-origin patenting in Telecommunications decreased slightly. There were 27.8% more patented applications filed in 1980 than in 1970. The number of foreign-origin patented applications filed in 1980 was more than double the number in 1970, while U.S.-origin patented applications decreased by 4.0%.

Patent activity in Telecommunications has also increased relative to the patent activity for all technologies. In 1970, 3.4% of all patented applications disclosed Telecommunications technology. By 1980 this figure increased to 4.6%.

Origins of U.S. Patents in Telecommunications

Of the 48,378 Telecommunications patents granted between 1963 and 1983, 32.0% were of foreign origin. Of these, about one-third were granted to residents of Japan.

In more recent years, however, Japan's percentage of the foreign-origin patents has increased. Figure 3 shows that from 1980-1983 Japanese residents received 44.9% of the foreign-origin Telecommunications patents. During this period, another 45.6% of the foreign-origin Telecommunications patents were issued to residents of five countries: West Germany, France, the United Kingdom, the Netherlands, and Canada. West German residents received 14.9%, French residents received 11.6%, residents of the United Kingdom received 9.5%, residents of the Netherlands received 5.1%, and residents of Canada received 4.5%. The remaining 9.5% of the foreign-origin patents were issued to residents of more than 20 other foreign countries.

Figure 4 shows U.S. Telecommunications patents granted to residents of the top four foreign countries. In 1963 the United Kingdom, with 77 patents, led foreign countries in the number of U.S. Telecommunications patents, while residents of Japan received only 19 patents. In 1966 West Germany took over the lead and held it until 1971 when Japan became number one with 209 patents. From 1970-1983, the patenting levels for West Germany, the United Kingdom and France hovered between 70 and 177 patents per year. During the same period, Japan's patenting increased from 117 to 530 Telecommunications patents per year.

FIGURE 3
U.S. TELECOMMUNICATIONS PATENTS
GRANTED TO RESIDENTS OF FOREIGN COUNTRIES
1980–1983

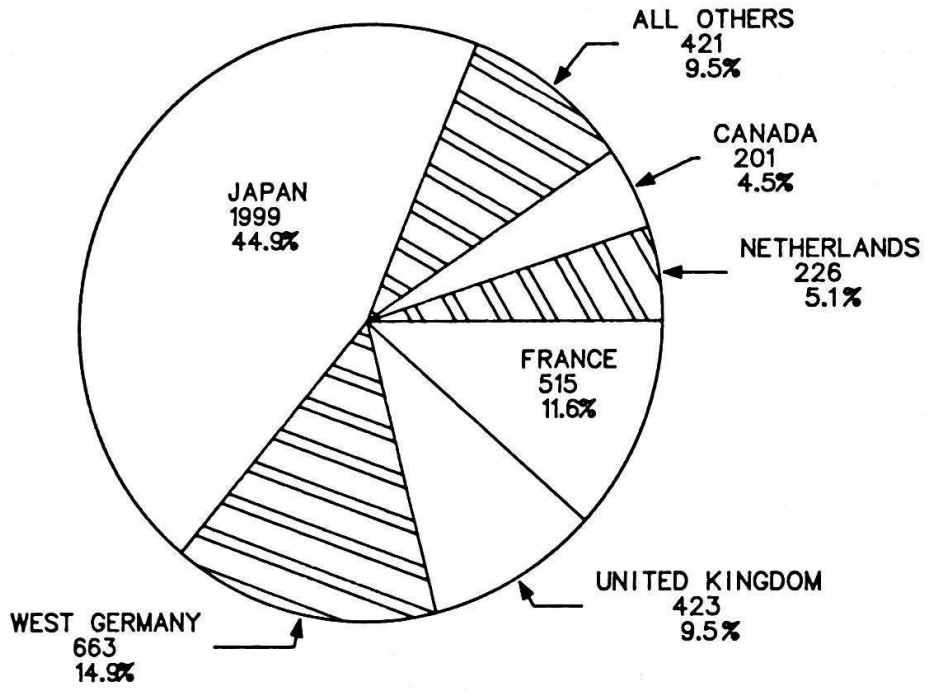
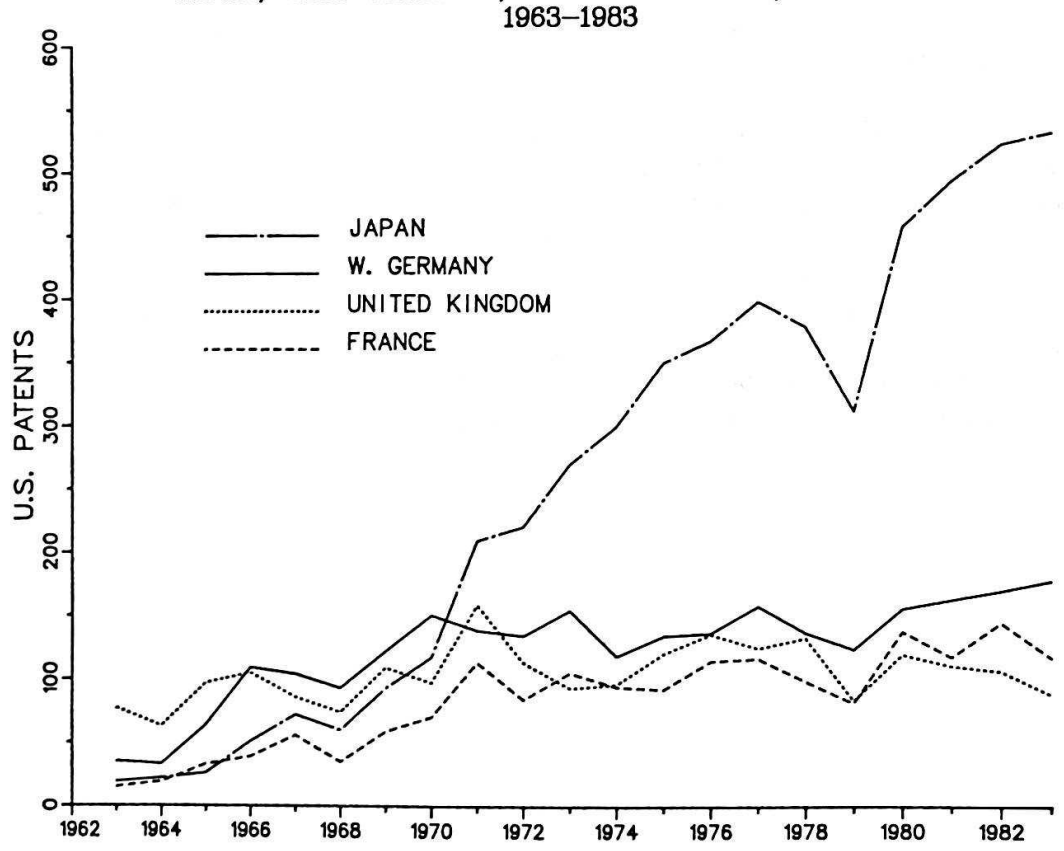


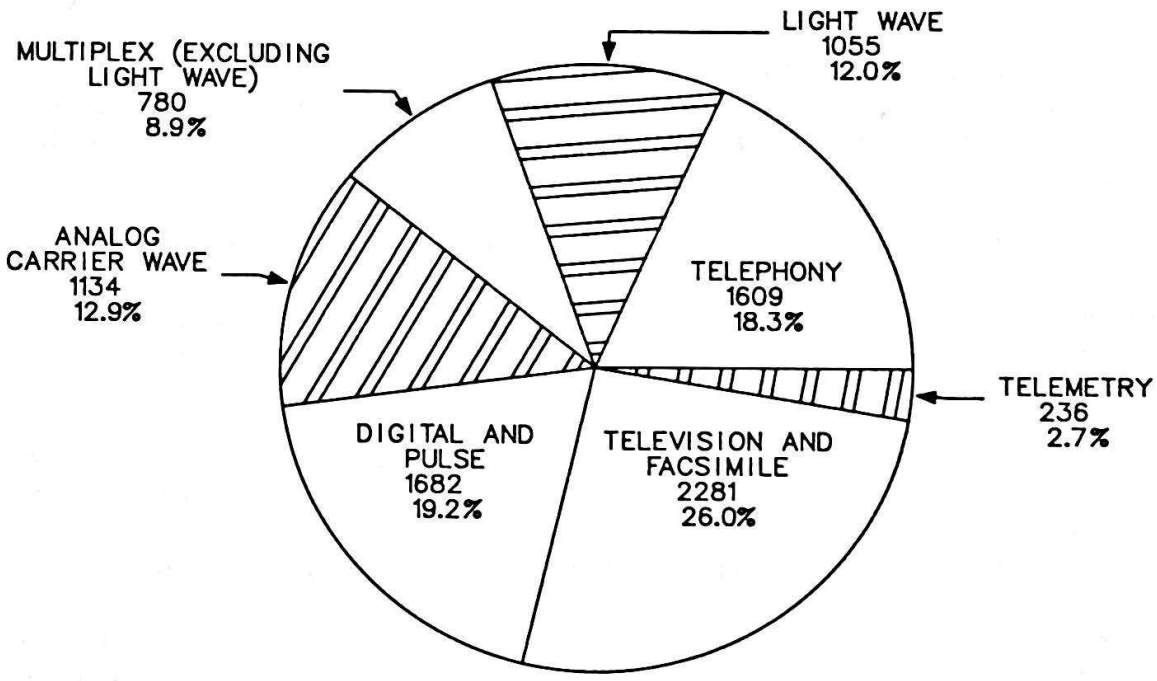
FIGURE 4
U.S. TELECOMMUNICATIONS
PATENTS GRANTED TO RESIDENTS OF
JAPAN, WEST GERMANY, UNITED KINGDOM, AND FRANCE
1963–1983



Comparison of Patent Activity in Major Areas of Telecommunications

Figure 5 illustrates the distribution of U.S. Telecommunications patents, granted between 1981 and 1983, among seven major areas of the technology. More than one out of every four U.S. Telecommunications patents disclosed Television or Facsimile technology. Another 19.2% disclosed Digital and Pulse Communications technology. The third largest area of patenting was Telephony, with 18.3%, followed by Analog Carrier Wave Communications, Light Wave Communications, and Multiplex Communications, in that order. The area with the least number of patents was Telemetry, with 2.7% of the Telecommunications patents issued by the PTO from 1981-1983.

FIGURE 5
COMPARISON OF PATENT ACTIVITY IN
MAJOR AREAS OF TELECOMMUNICATIONS
1981–1983



NOTE: Patents which disclosed technology appropriate to more than one major area are counted in each of them. Although the sum of the count of patents in the seven areas is 8,777, only 7,621 U.S. Telecommunications patents issued from 1981-1983.

Table 1 summarizes U.S. patent activity in all technologies combined, all Telecommunications technologies, the seven major areas, and twenty subdivisions of Telecommunications. It presents 1981-1983 patent activity in terms of 3-year/10-year share, foreign share, corporate owned, government owned, and U.S. owned of foreign origin. These parameters are expressed as percentages and are defined in the Explanation of Data and Format section on page 6.

Five out of the seven major areas of Telecommunications have a higher 3-year/10-year share than the all technologies' average. The 3-year/10-year share for both Telephony and Telemetry is less than for all technologies (27.2% and 26.9% respectively).

Of the subdivisions of Telecommunications, Facsimile or Pictorial Communication Systems has the greatest 3-year/10-year share, 39.7%. The subdivision with the least 3-year/10-year share is Frequency Division Multiplexing with 23.5%.

From 1981-1983, 44.5% of the Telecommunications patents are of foreign origin, more than the average for all technologies, which is 41.3%. Facsimile or Pictorial Communication Systems has the greatest percentage of foreign-origin patents, with 56.0%, followed by Binaural and Stereophonic Systems with 54.4%. The least foreign activity is in Telemetry, where only 29.2% of the 1981-1983 patents are of foreign origin.

Of the 21 separate areas which encompass Telecommunications (Telemetry plus 20 subdivisions), nine have a lower percentage of foreign-origin patents than the average for all technologies, and twelve have a higher percentage.

The percentage of corporate-owned, 1981-1983 patents ranges from 72.0% of the patents in Binaural and Stereophonic Systems to 94.8% in Error Checking and Correction. In Telecommunications as a whole, 86.2% of the patents are corporate owned, nearly nine percentage points more than the average for all technologies.

When all technologies are considered, 2.4% of the 1981-1983 patents are assigned to U.S. and foreign government organizations. In Telecommunications as a whole the figure is 3.4%, and it goes as high as 7.9% for patents disclosing a Light Transmitting Fiber, Wave Guide, or Rod.

This higher-than-average government activity in Telecommunications is partly due to the large number of patents assigned to the U.S. Navy, which received 732 Telecommunications patents from 1969-1983. The U.S. Navy ranks sixth among organizations with the most Telecommunications patents for that period.

TABLE 1

TELECOMMUNICATIONS vs. ALL TECHNOLOGIES: COMPARISON OF ACTIVITY SUMMARIES
1981-1983

AREAS OF TECHNOLOGY	3YR/10YR SHARE (%)	FOREIGN SHARE (%)	CORP. OWNED (%)	GOVT. OWNED (%)	U.S. OWNED OF FOREIGN (%)	81-83 PATENT COUNT	63-83 PATENT COUNT
ALL TECHNOLOGIES	28.2	41.3	77.4	2.4	7.2	180,522	1,349,401
TELECOMMUNICATIONS	30.5	44.5	86.2	3.4	12.1	7,621	48,378
1.0 TELEPHONY	27.2	39.2	81.3	1.6	10.0	1,609	11,748
1.1 Subscriber and Substation Equipment Including Key Telephone Systems	28.6	39.1	77.9	1.8	8.9	1,213	8,061
1.2 Central Office Equipment, Switching Systems, Repeaters, and Testing Systems and Devices	24.7	39.0	90.6	0.9	15.2	541	4,624
2.0 LIGHT WAVE COMMUNICATIONS	31.8	48.5	86.3	6.7	12.9	1,055	5,376
2.1 Light Wave and Multiplexed Light Wave Communication Per Se	36.0	41.0	80.3	7.3	5.5	178	1,010
2.2 Light Transmitting Fiber, Waveguide, or Rod	32.3	48.2	85.7	7.9	12.9	722	3,314
2.3 Laser Light Sources and Detectors	28.2	52.6	93.0	2.8	17.0	213	1,295
3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)	31.3	47.6	86.9	3.2	15.1	780	4,125
3.1 Frequency Division Multiplexing (FDM)	23.5	45.7	87.0	2.2	19.0	46	354
3.2 Time Division Multiplexing (TDM) Including Combined FDM/TDM	34.2	44.6	91.0	3.0	16.7	498	2,365
3.3 Binaural and Stereophonic Systems	24.0	54.4	72.0	1.6	10.3	125	854
3.4 Other Multiplexing Methods, Duplex, Diplex, and Testing	34.5	53.0	87.2	4.6	13.8	219	1,075
4.0 ANALOG CARRIER WAVE COMMUNICATIONS	30.5	42.5	85.2	3.3	7.7	1,134	7,522
4.1 Transmitter Circuits and Systems	29.7	38.3	74.5	6.0	3.5	149	1,236
4.2 Receiver or Frequency Convertor Circuits and Systems	31.7	46.4	87.4	2.0	7.8	741	4,442
4.3 Other Systems	29.3	35.4	80.0	5.1	7.1	395	2,713
5.0 DIGITAL AND PULSE COMMUNICATIONS	30.3	40.0	90.6	3.5	14.9	1,682	12,530
5.1 Transmitters Including Digital Modulators and Transceivers	24.1	38.1	85.7	4.0	20.8	126	1,410
5.2 Receivers Including Demodulators, Repeaters and Equalizers	32.0	41.2	93.8	3.4	23.1	325	2,022
5.3 Particular Modulation Techniques, Systems Using Alternating or Pulsating Current, Secret Communication and Multi-Level Systems	27.6	37.9	86.6	4.3	16.2	554	4,373
5.4 Error Checking and Correction Including Testing and Synchronization	35.3	42.5	94.8	2.7	14.2	562	2,933
5.5 Code Conversion	28.3	41.7	89.4	4.0	13.2	453	4,264
6.0 TELEVISION AND FACSIMILE	35.2	48.7	88.5	2.6	11.7	2,281	11,199
6.1 Natural and Pseudo Color Television	34.9	52.1	92.8	0.5	17.8	582	2,943
6.2 Television Circuits and Systems Not Limited to Color Applications	35.0	43.8	85.8	3.6	12.8	1,533	7,375
6.3 Facsimile or Pictorial Communication Systems	39.7	56.0	93.5	0.8	5.0	505	2,052
7.0 TELEMETRY	26.9	29.2	78.0	3.8	5.8	236	2,192

NOTE: See page 6 for definitions of 3yr/10yr Share, Foreign Share, Corporate Owned, Government Share, and U.S. Owned of Foreign. A technology which has the same number of patents issued each year for 1974-1983 will show a 3yr/10yr Share of 30%.

More than 12% of the Telecommunications patents issued to foreign resident inventors from 1981-1983 were assigned to U.S. organizations. This is significantly greater than the 7.2% average for all technology patents. This category normally indicates U.S. corporations with some research and development activities at overseas locations. For instance, U.S. organizations such as International Standard Electric Corporation, IBM, and RCA Corporation have some foreign-origin Telecommunications patents. However, in Telecommunications the higher-than-average percentage of foreign-origin patents assigned to U.S. corporations is largely due to foreign multinational corporations which conduct research and development overseas and then assign the resulting U.S. patents to their U.S. affiliates. Most of the U.S.-owned, foreign-origin patents in Telecommunications are assigned to U.S. Philips Corporation, North American Philips Corporation, and Sony Corporation.

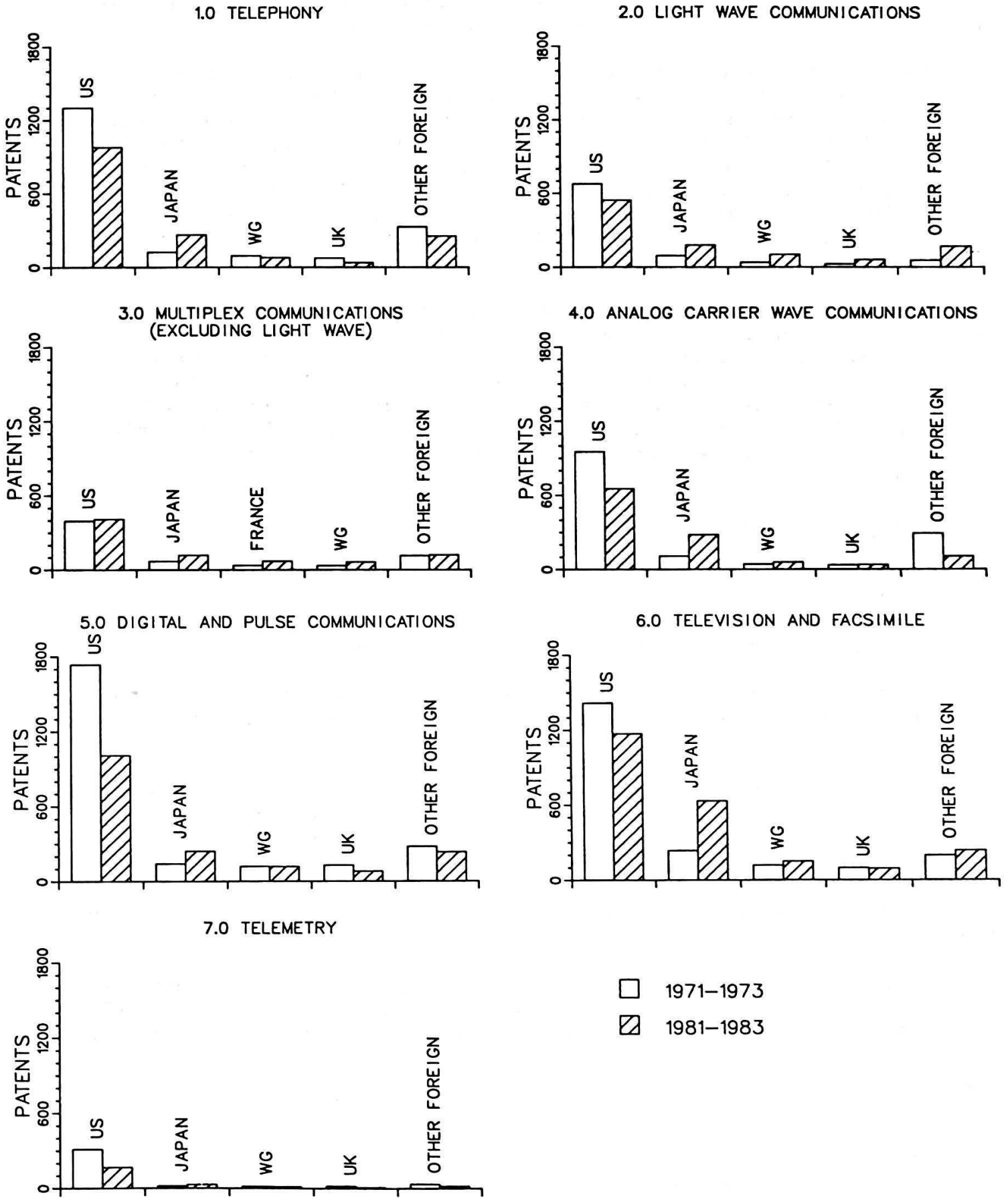
Country of Origin of Patents in Major Areas of Telecommunications

Figure 6 compares patents granted from 1971-1973 with the period 1981-1983 by country of origin and major area. The top four countries in each of the major areas were determined by their rank over the period 1963-1983. The United States and Japan are ranked first and second in each category. Although West Germany and the United Kingdom rank third or fourth in six of seven areas, France's activity in Multiplex Communications earned it fourth place in that area, ahead of the United Kingdom.

The United States is first in every area for both time periods highlighted in Figure 6. However, residents of the United States decreased their patenting in six of seven major areas of Telecommunications between time periods. Multiplex Communications was the only area where U.S. residents received more patents during the second period (409, up from 394). On a percentage basis, however, U.S. resident activity in that area decreased from 60.9% in the first period to 52.4% in the second.

Figure 6 also shows that Japan is the foreign country receiving the greatest number of U.S. Telecommunications patents, in all seven areas and during both time periods. Japanese inventors were least active in Telemetry, where they had 4.6% of the 1971-1973 patents and 12.7% of the 1981-1983 patents. They were most active in the area of Television and Facsimile, where they had 11.4% of the patents in the first period, and 27.7% of the patents in the second.

FIGURE 6
COUNTRIES OF ORIGIN OF U.S. PATENTS IN
SEVEN AREAS OF TELECOMMUNICATIONS
1971–1973 vs. 1981–1983



State of Origin of Patents in Major Areas of Telecommunications

Table 2 shows the six most active states in each of the seven major areas of Telecommunications. For comparison purposes, it also shows, for these states, the number of patents in all technologies and all Telecommunications and their corresponding ranks in each category.

The three most active states in both all Telecommunications and all technologies are California, New York and New Jersey. They are also the only states which are in the top six in all major areas of Telecommunications. Illinois is in the top six in all areas except Telemetry and Light Wave Communications, and Massachusetts is in the top six in all areas except Television and Facsimile. Maryland, which for all technologies only ranks fourteenth and for all Telecommunications eighth, is in the top six in three categories: Multiplex, Analog Carrier Wave, and Digital and Pulse Communications.

In general, states which are in the top 10 for all technologies are also in the top 10 for all Telecommunications. Michigan, Ohio and Florida are exceptions. Although both Ohio and Michigan residents are very active in patenting (sixth and seventh in all technologies), neither is in the top 10 for Telecommunications. The opposite is true of Florida, which is tenth in Telecommunications, but fifteenth in all technologies. Neither Florida nor Michigan are in the top six in any of the major areas of Telecommunications.

Organizations Assigned U.S. Telecommunications Patents

Table 3 lists the top four organizations in each of the seven major areas of Telecommunications. Only a few organizations dominate the patenting in Telecommunications. Of these, Bell Telephone Laboratories Inc. is the leader. In four out of seven areas, it is number one.

Table 4 shows the distribution of Telecommunications patents in terms of the number of organizations, and how many patents each organization was assigned.*

A total of 4,118 organizations were assigned U.S. Telecommunications patents between 1969 and 1983. Three organizations together -- Bell Telephone Laboratories Inc. (2522 patents), RCA Corporation (1320 patents), and International Business Machines Corporation (1027 patents) -- were assigned 14.2% of the patents granted during the period. Less than 9% of the organizations patenting in Telecommunications were assigned 79.0% of the 1969-1983 patents.

Other leading organizations are U.S. Philips Corporation (888 patents), Siemens AG (796 patents), the U.S. Navy (732 patents), Motorola Inc. (731 patents), and International Standard Electric Corporation (629 patents).

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* See Appendix A for an explanation of assignee and assignment data.

TABLE 2

MOST ACTIVE STATES IN TELECOMMUNICATIONS PATENTING
1963-1983

STATE	NUMBER OF PATENTS									RANK	
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	ALL TECH	ALL TC	ALL TECH	ALL TC
California	1,141	661	363	763	1,684	1,294	248	120,436	5,442	1	1
New York	1,020	592	304	620	1,319	1,267	166	96,651	4,679	2	3
New Jersey	1,444	810	452	633	1,320	960	103	76,244	4,964	3	2
Illinois	1,041	*	259	704	523	789	*	73,632	3,090	4	4
Pennsylvania	*	136	*	*	*	292	145	67,281	1,348	5	6
Ohio	289	*	*	*	*	*	*	61,052	910	6	11
Massachusetts	372	339	121	300	663	*	109	39,979	1,947	8	5
Texas	*	*	*	*	*	*	210	38,229	1,232	9	7
Connecticut	*	163	*	*	*	*	*	30,243	944	10	9
Indiana	*	*	*	*	*	396	*	22,485	876	11	12
Maryland	*	*	137	277	423	*	*	18,407	1,127	14	8

* Indicates not one of six states with the most patents in that area.
ALL TECH - All Technologies combined
ALL TC - All Telecommunications
1.0 - Telephony
2.0 - Light Wave Communications
3.0 - Multiplex Communications (Excluding Light Wave)
4.0 - Analog Carrier Wave Communications
5.0 - Digital and Pulse Communications
6.0 - Television and Facsimile
7.0 - Telemetry

TABLE 3

TOP FOUR ORGANIZATIONS PATENTING IN MAJOR AREAS OF TELECOMMUNICATIONS 1969-1983

MAJOR AREA	# PATENTS* 1969-1983	ORGANIZATION
1.0 Telephony	1091	Bell Telephone Laboratories Inc.
	310	GTE Automatic Electric Laboratories Inc.
	299	International Standard Electric Corp.
	198	International Telephone and Telegraph Corp.
2.0 Lightwave Communications	521	Bell Telephone Laboratories Inc.
	158	Siemens AG.
	148	United States of America, Navy
	130	RCA Corp.
3.0 Multiplex Communications (Excluding Lightwave)	343	Bell Telephone Laboratories Inc.
	153	Siemens AG.
	124	International Business Machines Corp.
	103	International Standard Electric Corp.
4.0 Analog Carrier Wave Communications	347	Motorola Inc.
	256	RCA Corp.
	169	Bell Telephone Laboratories Inc.
	138	United States of America, Navy
5.0 Digital and Pulse Communications	601	Bell Telephone Laboratories Inc.
	590	International Business Machines Corp.
	275	Siemens AG.
	226	United States of America, Navy
6.0 Television and Facsimile	843	RCA Corp.
	336	U.S. Philips Corp.
	331	Sony Corp.
	286	Zenith Radio Corp.
7.0 Telemetry	45	General Electric Co.
	41	Schlumberger Technology Corp.
	40	Westinghouse Electric Corp.
	30	United States of America, Navy

* A patent may be assigned to more than one area if it discloses more than one technology.

TABLE 4

DISTRIBUTION OF TELECOMMUNICATIONS PATENTS OWNED BY ORGANIZATIONS
1969-1983

PATENTS PER ORGANIZATION	ORGANIZATIONS		PATENTS	
	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL
1000 & up	3	0.1	4,869	14.2
500 - 999	8	0.2	5,451	16.0
100 - 499	41	1.0	8,894	26.0
50 - 99	36	0.9	2,746	8.0
10 - 49	271	6.6	5,060	14.8
1 - 9	3,759	91.3	7,163	21.0
TOTAL	4,118	100	34,183	100

Conclusions

- The number of Telecommunications patents (distributed by year of application filing) was 27.8% greater in 1980 than in 1970. This is largely because of the dramatic increase in foreign-origin patenting in the United States. The U.S.-origin patent activity in 1980 was 4.0% less than in 1970.

- Foreign-origin Telecommunications patents (distributed by year of patent grant) increased from 25.6% of the total in 1970 to 43.8% in 1983. Most of this increase (88.8%) resulted from Japanese-origin patenting in the United States.

- From 1980-1983, Japanese residents received 44.9% of the foreign-origin U.S. patents, residents of West Germany, France, the United Kingdom, the Netherlands and Canada together received 45.6% of the foreign-origin patents.

- From 1981-1983, 4.4% of Telecommunications patents were assigned to government organizations. This is higher than the 2.7% average for all technologies. The U.S. Navy accounts for most of this patenting.

- A higher-than-average percentage of Telecommunications patents were assigned to corporate and government organizations, rather than individuals. This probably is due to the complexity and the expense of research and development in this technology.

- Most Telecommunications patents are owned by relatively few companies. Less than 9% of the 4,118 organizations active in Telecommunications patenting were assigned 79.0% of the patents granted from 1969-1983. The top three organizations were assigned 14.2% of the patents.

- Among the seven major areas of Telecommunications, Digital and Pulse Communications had the most patents from 1963-1983, Television and Facsimile had the most patents from 1981-1983.

- Among the 20 subdivisions of Telecommunications, Facsimile or Pictorial Communication Systems and Light Wave and Multiplexed Light Wave Communications had the greatest 3-year/10-year share.

* * * *

The remainder of this publication consists of in-depth profiles of major areas and subdivisions of Telecommunications. These enable more detailed analysis of this technology. Patent numbers for all patents and titles of post-1968 patents used in this report are available on microfiche from the National Technical Information Service. See Appendix B for information on ordering the microfiche supplement.

1.0 TELEPHONY

CONTENTS

1.0 TELEPHONY

INTRODUCTION

Telephony is the use of instruments and electricity to transmit speech and other sounds. This publication defines telephony as the analog signal representation of sounds and the transmission and reception of such signals. This section profiles telephony in two general categories. The first profile is subscriber and substation equipment, and the second is central office and other subscriber linking equipment. These profiles specifically exclude digital communication techniques, multiplex communications systems, analog carrier wave systems, and light wave communications, all of which are covered elsewhere in this report. They also exclude wave transmission lines and networks per se since they do not pertain exclusively to telephony.

1.0 TELEPHONY

ACTIVITY SUMMARY

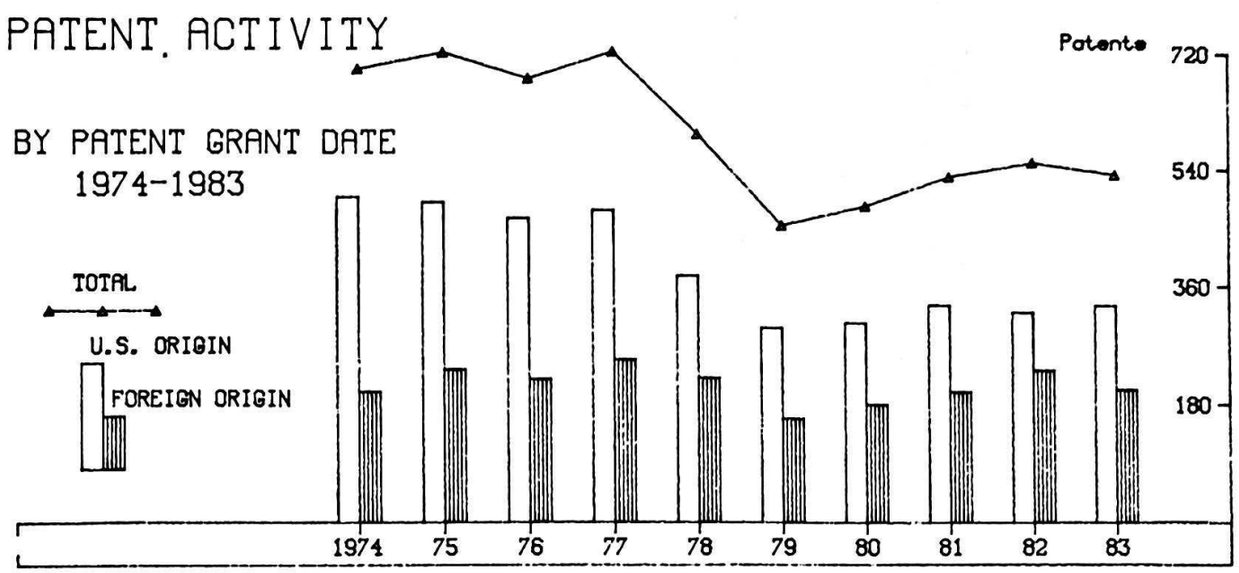
ACTIVITY INDICES (1981 - 1983)

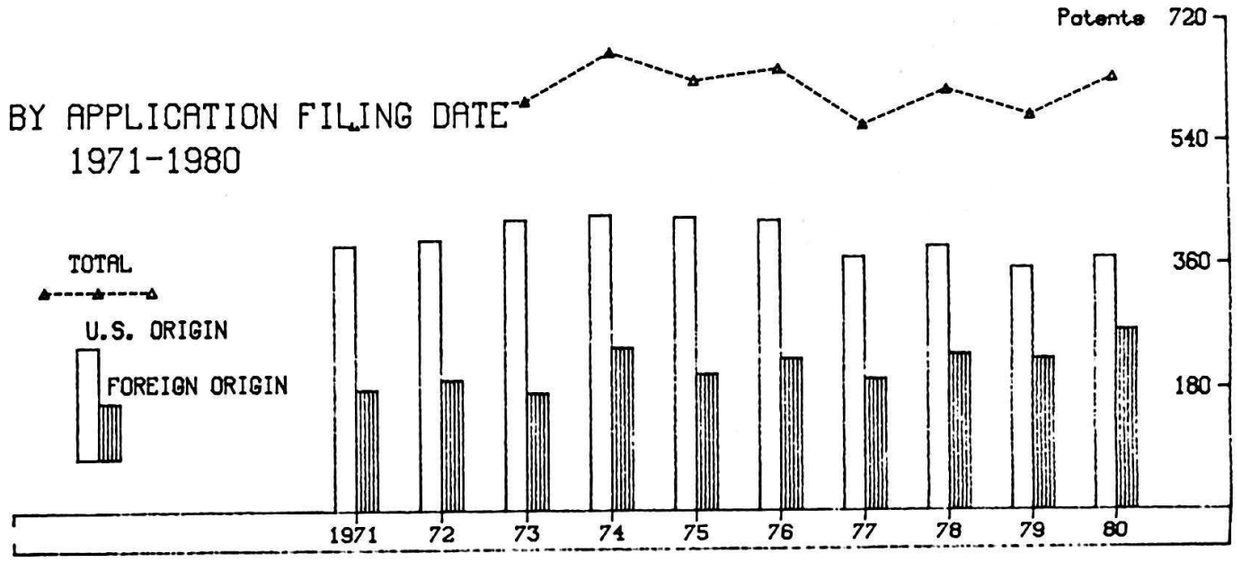
3-YEAR/10-YEAR SHARE	27.2%
FOREIGN SHARE	39.2%
CORPORATE OWNED	81.3%
GOVERNMENT OWNED	1.6%
U.S. OWNED OF FOREIGN	10.0%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 179, Subclasses 1.1-106, 108-190

Class 381, Subclasses 29-59, 61-66, 71, 73, 74, 76-124





1.0 TELEPHONY

ORGANIZATIONS ASSIGNED 15 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
1091	BELL TELEPHONE LABORATORIES, INC.
310	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
299	INTERNATIONAL STANDARD ELECTRIC CORP.
198	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
195	SIEMENS AG.
182	STROMBERG-CARLSON CORP.
153	NORTHERN TELECOM LTD.
139	U.S. PHILIPS CORP.
101	MOTOROLA INC.
97	INTERNATIONAL BUSINESS MACHINES CORP.
91	HITACHI, LTD.
81	NIPPON ELECTRIC CO., LTD.
79	PIONEER ELECTRONIC CORP.
72	TELEFONAKTIEBOLAGET LM ERICSSON
68	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
57	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
57	UNITED STATES OF AMERICA, NAVY
53	GENERAL ELECTRIC CO.
53	SONY CORP.
51	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
50	AKG AKUSTISCHE U. KINO-GERATE GMBH
49	AUTOMATIC ELECTRIC LABORATORIES INC.
46	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
45	RCA CORP.
45	WESTERN ELECTRIC CO., INC.
43	AMERICAN TELEPHONE AND TELEGRAPH INC.
40	GTE SYLVANIA INC.
34	VICTOR CO. OF JAPAN, LTD.
33	TEXAS INSTRUMENTS, INC.
32	TOKYO SHIBAURA ELECTRIC CO., LTD.
31	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
31	POST OFFICE
31	XEROX CORP.
29	PORTA SYSTEMS CORP.
28	COMMUNICATIONS SATELLITE CORP.
28	LORAIN PRODUCTS CORP.
28	UNITED STATES OF AMERICA, ARMY
28	WESTINGHOUSE ELECTRIC CORP.
27	KOKUSAI DENSHIN DENWA K.K.
25	NIPPON GAKKI SEIZO K.K.
22	THOMSON-CSF
20	ROCKWELL INTERNATIONAL CORP.
20	SHARP K.K.
19	BELL CANADA-NORTHERN ELECTRIC RESEARCH LTD.
18	ELECTRO-VOICE, INC.
18	GENERAL ELECTRIC CO. LTD.
18	NORTH ELECTRIC CO.
18	WESCOM, INC.
18	ZENITH RADIO CORP.
17	BURROUGHS CORP.
17	IWATSU ELECTRIC CO., LTD.
17	PLESSEY HANDEL UND INVESTMENTS AG.
16	LICENTIA PATENT-VERWALTLUNGS-GMBH
16	MITEL CORP.
16	SUPERIOR CONTINENTAL CORP.
16	T.A.D. AVANTI INC.
16	TRW INC.
15	FORD AEROSPACE & COMMUNIC. CORP.
15	HARRIS CORP.
15	NIPPON COMMUNICATION INDUSTRIAL CO. LTD.
15	TEL-TONE CORP.

1.0 TELEPHONY

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	3234	689	686	600	613	689	714	674	717	591	451	481	527	550	532	11748
U.S. ORIGIN	2437	467	468	396	418	492	484	459	472	373	294	302	329	319	330	8040
FOREIGN ORIGIN	797	222	218	204	195	197	230	215	245	218	157	179	198	231	202	3708
JAPAN	75	25	33	46	43	57	91	71	76	65	54	68	74	84	104	966
WEST GERMANY	180	72	32	30	30	23	24	24	29	18	20	21	29	25	24	581
UNITED KINGDOM	156	26	31	26	17	20	31	19	26	29	17	14	11	16	11	450
FRANCE	67	13	40	24	29	16	21	29	25	29	18	26	19	29	11	396
CANADA	48	24	20	28	39	34	25	22	22	29	17	20	23	26	15	392
SWEDEN	88	18	5	11	7	7	7	9	7	13	4	4	5	3	3	191
NETHERLANDS	46	9	6	8	7	10	6	6	10	8	5	7	6	18	16	168
ITALY	21	7	15	11	10	12	5	15	18	8	9	9	6	13	7	166
AUSTRIA	36	6	13	8	3	2	4	1	3	3	5	2	3	3	1	93
SWITZERLAND	19	3	5	3	1	2	5	6	10	10	4	3	6	3		80
BELGIUM	33	10	10	4	2		4	3	2	2		1	1	1	1	74
AUSTRALIA	6	2			2	1		2	2	1			5	1	1	23
DENMARK	6	1		1	1			1	3	1	2			2	1	19
U.S.S.R.		1	1			3	1		4	1		2				13
ISRAEL	1	1	2				1	2					2	1	1	11
ARGENTINA	2		1			2			1						3	9
NORWAY	2		1	2				2	1		1					9
CHINA(TAIWAN)							1	1					3	1	1	7
GREECE		1			1	2								1		5
CZECHOSLOVAKIA	1	1	2				1									5
HUNGARY						1	1		2		1					5
FINLAND						2			1			1				4
HONG KONG													3	1		4
SPAIN				1		1								1		3
BRAZIL							1	1	1							3
S. AFRICA	2						1									3
INDIA	1			1												2
BULGARIA													1		1	2
LEBANON	1	1														2
MEXICO	1	1														2
SOUTH KOREA					1									1		2
THAILAND															1	1
CHINA P.REP.						1										1
COLOMBIA										1						1
CHILE												1				1
OTHER(14)	5		1		2	1		1	2				1	1		14
U.S. ORIGIN	2437	467	468	396	418	492	484	459	472	373	294	302	329	319	330	8040
U.S. CORP. OWNED	1926	374	370	325	332	378	372	350	365	263	215	216	247	230	263	6226
U.S. GOVT. OWNED	41	11	13	6	11	8	14	8	8	3	6	9	4	5	5	152
U.S. INDIV. OWNED	464	81	79	61	73	102	93	99	98	96	71	71	72	77	61	1598
FOREIGN OWNED	6	1	6	4	2	4	5	2	1	11	2	6	6	7	1	64
FOREIGN ORIGIN	797	222	218	204	195	197	230	215	245	218	157	179	198	231	202	3708
U.S. OWNED	249	83	76	47	36	47	44	33	27	24	12	27	15	30	18	768
FOREIGN OWNED	548	139	142	157	159	150	186	182	218	194	145	152	183	201	184	2940
FOREIGN CORP.	440	113	108	130	137	124	160	154	186	163	128	125	155	178	159	2460
FOREIGN GOVT.	10	1	4		2	1	1	1	1	9	1	7	5	5	2	50
FOREIGN INDIV.	98	25	30	27	20	25	25	27	31	22	16	20	23	18	23	430

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	3053	507	563	585	595	667	626	644	562	614	577	633	342	34		10002
U.S. ORIGIN	2156	348	385	393	422	429	426	422	369	385	354	369	216	18		6692
FOREIGN ORIGIN	897	159	178	192	173	238	200	222	193	229	223	264	126	16		3310
JAPAN	120	32	49	52	64	70	75	69	58	82	87	105	60	11		934
WEST GERMANY	227	21	21	19	20	30	21	26	16	28	34	29	15	1		508
UNITED KINGDOM	118	22	19	21	18	28	21	21	29	20	14	15	7			353
FRANCE	90	26	19	25	13	31	20	26	26	31	19	29	9	1		365
CANADA	73	18	35	33	27	29	10	28	23	24	28	29	12	1		370
SWEDEN	62	9	5	7	7	7	7	8	10	6	6	3	1	1		139
NETHERLANDS	40	5	9	6	7	7	9	4	9	7	6	27	7	1		144
ITALY	34	8	9	12	5	11	16	11	9	14	7	9	9			154
AUSTRIA	37	9	3	1	2	4	3	3	4	4	2	3	1			76
SWITZERLAND	19	1	2	1	4	6	6	14	4	3	4	4				68
BELGIUM	39	3		1	2	6	2	1	1		1	2				58
AUSTRALIA	6	1	1	1	1	1		3		2	4	1				21
DENMARK	6	1			1		2	2	2			2	1			17
U.S.S.R.	3		2			1	1	4		2						13
ISRAEL	3			1		2					3		1			10
ARGENTINA	3			2			1					2	1			9
NORWAY	4	1				1	2			1						9
CHINA(TAIWAN)						2					3	1	1			7
GREECE	1		1	2							1					5
CZECHOSLOVAKIA	4				1											5
HUNGARY				2			1	1	1							5
FINLAND				2				1		1						4
HONG KONG										3		1				4
SPAIN		1		1							1					3
BRAZIL				1		1	1									3
S. AFRICA					1											1
INDIA	1	1														2
BULGARIA											1		1			2
LEBANON	1															1
MEXICO	1															1
SOUTH KOREA				1							1					2
THAILAND												1				1
CHINA P.REP.				1												1
COLOMBIA									1							1
CHILE										1						1
OTHER(14)	5		3			1	2				1	1				13
U.S. ORIGIN	2156	348	385	393	422	429	426	422	369	385	354	369	216	18		6692
U.S. CORP. OWNED	1726	288	300	310	315	320	339	315	280	265	270	271	177	11		5187
U.S. GOVT. OWNED	51	7	12	8	9	9	6	7	4	3	5	6	4			131
U.S. INDIV. OWNED	370	49	72	73	91	100	77	98	76	110	72	87	33	7		1315
FOREIGN OWNED	9	4	1	2	7		4	2	9	7	7	5	2			59
FOREIGN ORIGIN	897	159	178	192	173	238	200	222	193	229	223	264	126	16		3310
U.S. OWNED	319	32	23	53	32	46	23	22	20	23	20	39	8	2		662
FOREIGN OWNED	578	127	155	139	141	192	177	200	173	206	203	225	118	14		2648
FOREIGN CORP.	466	104	135	113	119	166	147	172	148	168	174	197	107	12		2228
FOREIGN GOVT.	9	1	2	1	1		2	4	7	9	3	5	1			45
FOREIGN INDIV.	103	22	18	25	21	26	28	24	18	29	26	23	10	2		375

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

DEFINITION

This profile includes all telephone circuits and systems which do not involve the interconnection of subscribers in two-way communication. It additionally includes strictly local two-way systems such as intercoms, party lines, and key telephone systems. Examples of circuits, systems and elements in this profile are:

Telephone instruments
Microphones
Speakers
Dials
Amplifiers
Conference circuits
Coin and other paystation telephones
Speech analysis and synthesis
Signal compression and expansion techniques
Couplers
Telephone accessories
Secret systems
Call recorders.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 1.1 are:

U.S. Patent 4,046,972. This invention is an example of a typical station set. It uses a simplified key design with two indicating LEDs per key. It has an integrated circuit design to reduce size, cost, and power consumption, and a multiplexed data stream control to reduce the number and complexity of connecting leads.

U.S. Patent 4,122,308. This invention provides time and cost billing information to the subscriber during the telephone call.

U.S. Patent 4,332,980. This invention is a multiple services system which uses telephone lines to provide information other than standard voice communications. Available features include the continuous monitoring and central reporting of intrusion detectors; heat, smoke and fire alarms, police alert, medical alert, meter reading, and the remote display of centralized data bases.

U.S. Patent 4,348,550. This invention is an automatic dialer which responds to spoken commands.

United States Patent [19]

Huizinga et al.

[11] **4,046,972**

[45] **Sept. 6, 1977**

[54] **KEY TELEPHONE STATION SET CIRCUIT**

[75] Inventors: **Donald Dean Huizinga, Indianapolis; Edward William Underhill, Knightstown; James Arthur Whitcomb, Indianapolis, all of Ind.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **735,991**

[22] Filed: **Oct. 27, 1976**

[51] Int. Cl.² H04Q 5/18

[52] U.S. Cl. ..... 179/99; 179/84 L; 179/84 T

[58] Field of Search ..... 179/99, 18 J, 18 F, 179/18 FA, 84 T, 84 L

[56] **References Cited**

U.S. PATENT DOCUMENTS

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3,385,935	5/1968	Anderson et al.	179/99
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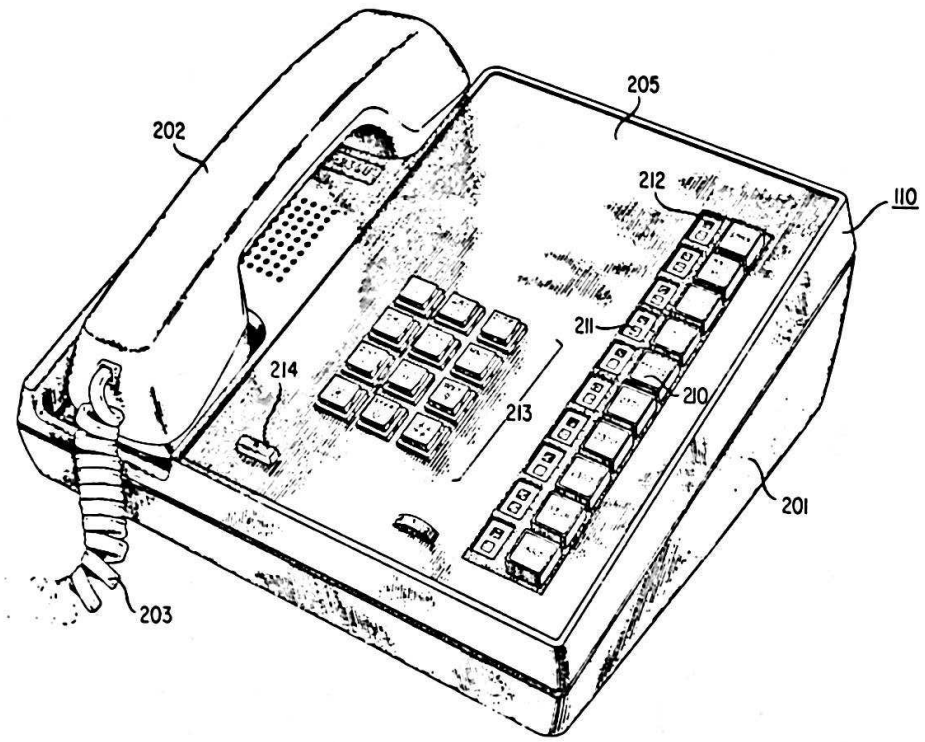
3,763,326	10/1973	Murtu et al.	179/99
3,843,845	10/1974	Ridley	179/99
3,906,168	9/1975	McEdwen	179/99
3,935,396	1/1976	Barsellotti et al.	179/99
3,946,146	3/1976	Brown et al.	179/99
3,973,085	8/1976	Shiff	179/99
3,991,282	11/1976	Feil	179/99

Primary Examiner—Kathleen H. Claffy
Assistant Examiner—Gerald L. Brigance
Attorney, Agent, or Firm—John W. Fisher

[57] **ABSTRACT**

An electronic key telephone station set includes a plurality of nonlocking line selection buttons. Adjacent each button is a pair of light emitting diode lamps, one for indicating which line selection button has been actuated and one for indicating which ones of other lines having an appearance on the station set are in use. Digital data coupled to and from the station set control the activation of the indicating lamps as well as the type of alerting signal generated to indicate an incoming call. Numerous other features may be advantageously implemented under data stream control.

16 Claims, 15 Drawing Figures



United States Patent [19]

Weinberger et al.

[11] **4,122,308**

[45] **Oct. 24, 1978**

[54] **TELEPHONE CALL METERING DEVICE**

[75] Inventors: **Gerald J. Weinberger, Commack; Stanley F. Miller, Rocky Point, both of N.Y.**

[73] Assignee: **Utility Verification Corp., Commack, N.Y.**

[21] Appl. No.: **803,203**

[22] Filed: **Jun. 3, 1977**

[51] Int. Cl.² H04M 15/18; H04M 17/00

[52] U.S. Cl. ..... 179/7.1 R; 179/6.3 R; 179/18 B

[58] Field of Search ..... 179/7.1 R, 7.1 TP, 7 R, 179/7 MB, 18 AD, 18 B, 18 D, 18 DA, 18 ES, 27 FF, 6.3 R, 6.31, 6.4, 6.5

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,702,381	11/1972	Halbedel et al.	179/27 FF
3,769,463	10/1973	Graham et al.	179/7.1 TP
3,806,652	4/1974	Woolf et al.	179/7.1 R
3,931,476	1/1976	Matthews	179/18 DA
4,041,291	8/1977	Pavda	179/7.1 R
4,045,619	8/1977	Harrington	179/7.1 R

OTHER PUBLICATIONS

"The New Coin Box Set AZ 44," *Hasler Review*, vol. 9, No. 2, pp. 51-56, Summer 1976, A. Nyffenegger.

Primary Examiner—William C. Cooper
Assistant Examiner—Gerald L. Brigance
Attorney, Agent, or Firm—Arthur L. Lessler

[57] **ABSTRACT**

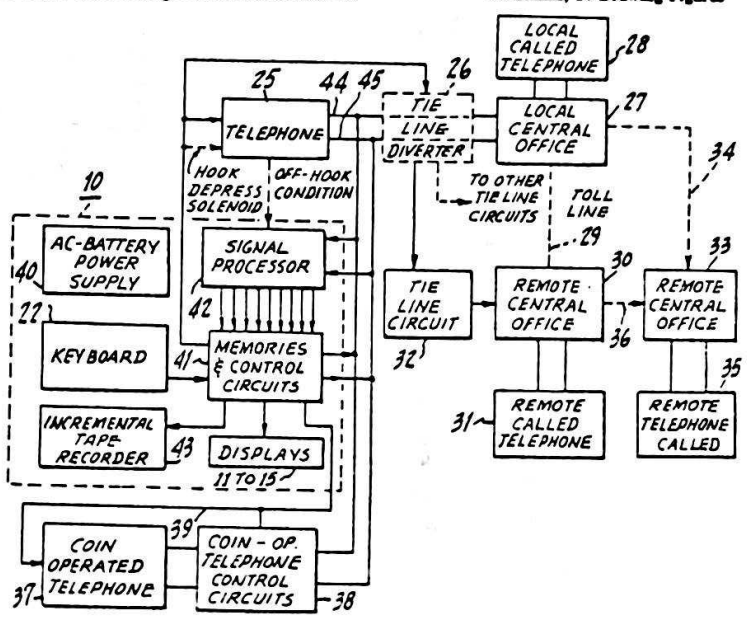
A telephone accessory device for monitoring the cost of a telephone call at the location of the calling telephone. A keyboard is provided through which the number to be called is entered; this number appears on a display and can be checked for accuracy before the number is actually "dialed" by depressing another key on the keyboard. At this time the initial billing rate and initial billing time period appear on digital displays, as well as the billing rate for the next billing time period and the corresponding period duration. Circuitry is provided to continually maintain the billing displays on a current basis, to provide an accurate indication of the cost of the call. At the conclusion of the call the total cost thereof is automatically entered into an accumulator which provides information as to the total month-to-date costs of calls placed from the telephone.

Determination of the cost of each call is made by addressing a memory which contains billing rate information, the memory being addressed in accordance with the number of the telephone called.

Provision is made to provide warning signals indicating when (i) the cost of a particular call exceeds a preset dollar limit or (ii) the end of a billing rate period is being approached. Information respecting the cost of each call and, if desired, an identification file or account number, may be coupled to an incremental tape recorder to provide a complete permanent record of telephone calls made during a particular time period.

Also described is a telephone call routing device for selecting that one of a number of the line circuits which minimizes the cost of a call to a specified telephone number. According to another disclosed feature, the cost metering device of the invention is incorporated in a coin operated telephone to meter payment for long distance calls without operator intervention.

45 Claims, 14 Drawing Figures



United States Patent [19]

Reynolds et al.

[11] **4,332,980**

[45] **Jun. 1, 1982**

[54] **MULTIPLE SERVICES SYSTEM USING TELEPHONE LOCAL LOOP**

[75] Inventors: **Christopher C. Reynolds**, Satellite Beach; **Earl J. Claire**, Melbourne Beach; **John R. Ellis**, West Melbourne, all of Fla.

[73] Assignee: **Harris Corporation**, Melbourne, Fla.

[21] Appl. No.: **154,825**

[22] Filed: **May 30, 1980**

[51] Int. Cl.³ H04M 11/04

[52] U.S. Cl. ..... 179/2 A; 179/2 AM; 179/5 R; 340/870.02

[58] Field of Search ..... 179/2 A, 2 AM, 2 DP, 179/5 R, 5 P; 340/150, 151, 163

[56] **References Cited**

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3,937,890	2/1976	Blethen et al.	179/2 AM
4,086,434	4/1978	Bocchi	179/2 AM
4,241,237	12/1980	Paraskevakos et al.	179/2 AM

Primary Examiner—John H. Wolff

Assistant Examiner—J. A. Popek

Attorney, Agent, or Firm—Craig & Antonelli

[57] **ABSTRACT**

A multiple services system using telephone lines to supply various data services to subscribers, including alarm surveillance, meter reading, energy management and digital data service, provides a multi-conductor subscriber bus at the subscriber premises for selective connection of plural data service terminals to the system and a switching communication controller at the central office which acts as a concentrator for the transmission of alarm, meter reading and control signals between the subscriber data system and a central control system, while acting as a switch for the connection of the subscriber data system to a data service system for transmission to the subscriber of digital video display data on request. The transmission over the telephone lines is transparent to normal telephone service and all communications within the system, including those on the subscriber bus, are effected in accordance with a predetermined link control protocol.

43 Claims, 27 Drawing Figures

United States Patent [19]

Pirz et al.

[11] **4,348,550**

[45] **Sep. 7, 1982**

[54] **SPOKEN WORD CONTROLLED AUTOMATIC DIALER**

[75] Inventors: **Frank C. Pirz**, Madison; **Lawrence R. Rabiner**; **Aaron E. Rosenberg**, both of Berkeley Heights; **Jay G. Wilpon**, North Plainfield, all of N.J.

[73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J.

[21] Appl. No.: **128,842**

[22] Filed: **Jun. 9, 1980**

[51] Int. Cl.³ G10L 1/00; H04M 1/274

[52] U.S. Cl. ..... 179/1 SD; 179/90 B; 179/1 VC

[58] Field of Search ..... 179/1 SD, 1 SB, 1 SM, 179/1 VC, 1 HF, 90 B, 90 BD, 90 BB, 2 DP, 18 B, 18 BA; 340/298, 328, 146.3 WD, 146.3 AQ

[56] **References Cited**

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Flanagan, J., "Computers That Talk and Listen", IEEE Proceedings, Apr. 1976, pp. 405–415.

Kitsopoulos, S. et al., "Experimental Telephone etc.", Bell Lab Rec. (USA), vol. 51, No. 9, Oct. 1973, pp. 272–277.

Baker, J., "The Dragon System–An Overview", IEEE Trans. on Acoustics, Speech and Sig. Proc., Feb. 1975, pp. 24–29.

Primary Examiner—Errol A. Krass

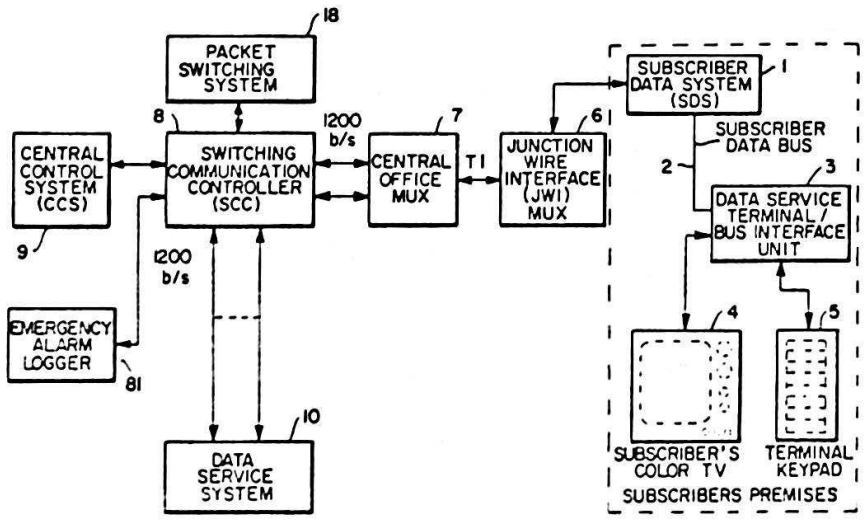
Assistant Examiner—E. S. Kemeny

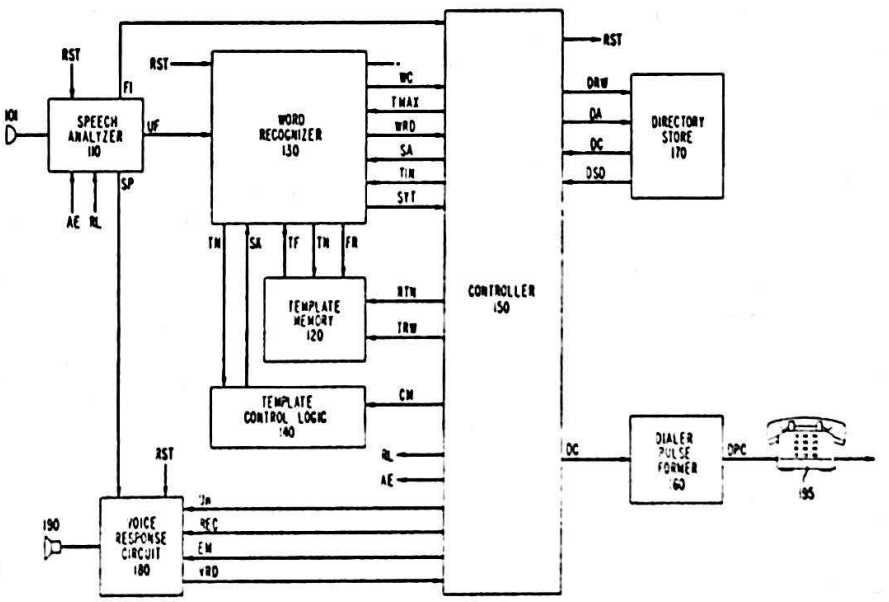
Attorney, Agent, or Firm—Jack S. Cubert

[57] **ABSTRACT**

A speech controlled dialing circuit identifies input utterances which may be a command word (mode select), repertory word (dialing name or number), or non-recognized ("Other"). Responsive to the identification of each occurring input utterance, a set of predetermined templates are selected to identify the next occuring utterance. A programmed microprocessor system is described to implement the main controller function.

16 Claims, 14 Drawing Figures





1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

ACTIVITY SUMMARY

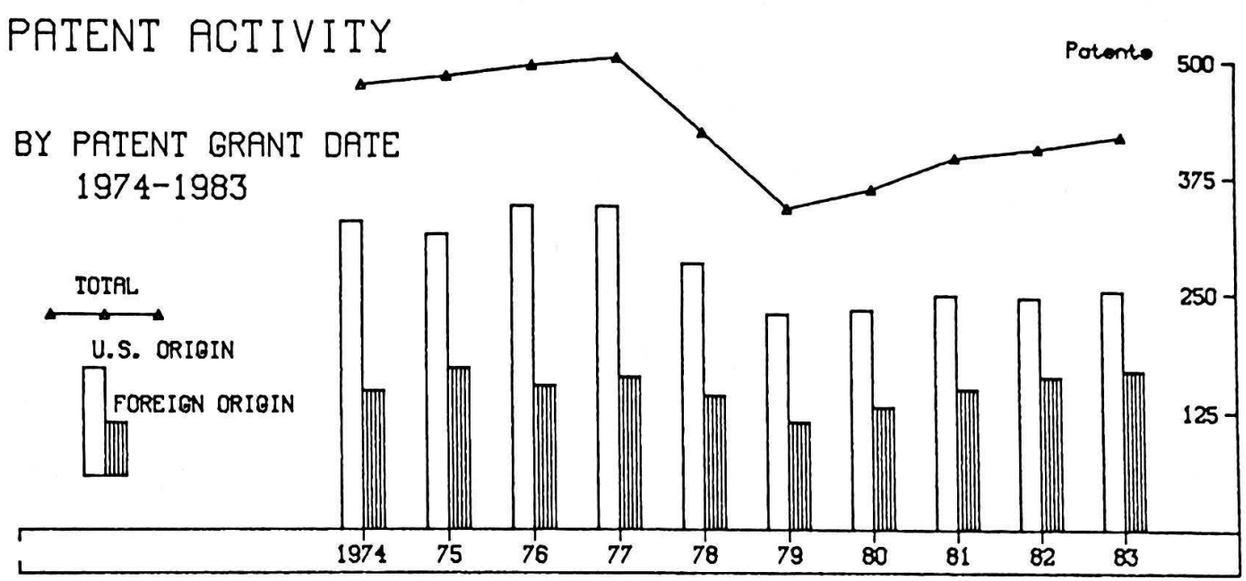
ACTIVITY INDICES (1981 - 1983)

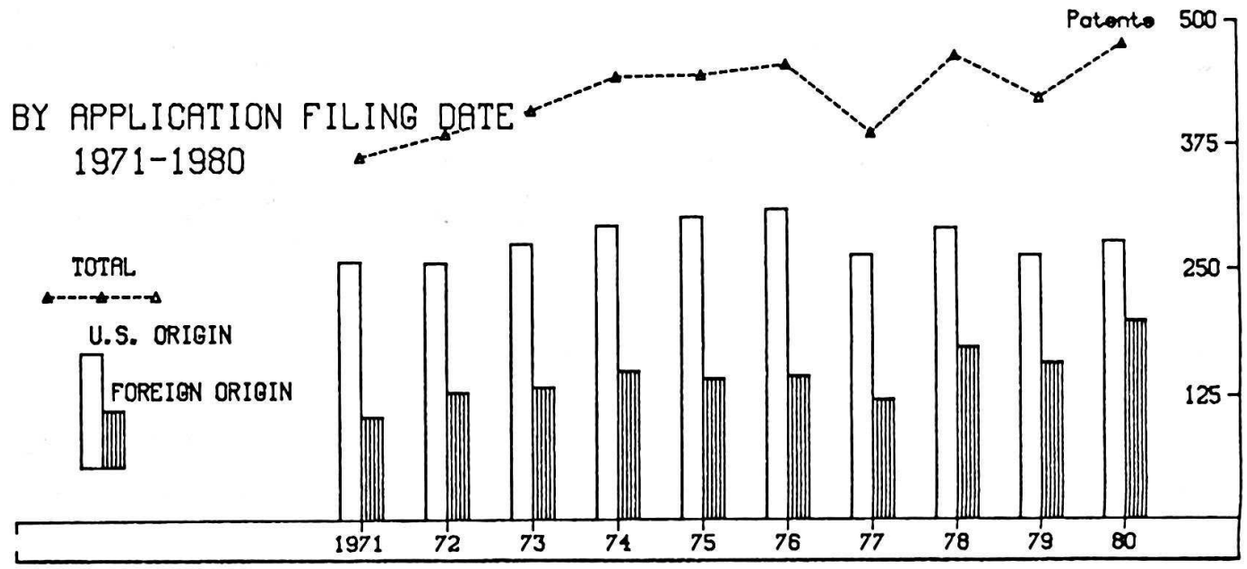
3-YEAR/10-YEAR SHARE	28.6%
FOREIGN SHARE	39.1%
CORPORATE OWNED	77.9%
GOVERNMENT OWNED	1.8%
U.S. OWNED OF FOREIGN	8.9%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 179, Subclasses 1.1-7.1TP, 11-14, 17R-17E, 27E, 28-40, 81R-90D, 99R-106, 108R-169, 178-190

Class 381, Subclasses 29-59, 61-66, 71, 73, 74, 76-124





1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

ORGANIZATIONS ASSIGNED 11 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
575	BELL TELEPHONE LABORATORIES, INC.
118	INTERNATIONAL STANDARD ELECTRIC CORP.
118	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
104	NORTHERN TELECOM LTD.
95	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
93	MOTOROLA INC.
91	U.S. PHILIPS CORP.
78	PIONEER ELECTRONIC CORP.
67	INTERNATIONAL BUSINESS MACHINES CORP.
62	SIEMENS AG.
57	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
53	SONY CORP.
51	STROMBERG-CARLSON CORP.
50	AKG AKUSTISCHE U. KINO-GERATE GMBH
49	NIPPON ELECTRIC CO., LTD.
47	UNITED STATES OF AMERICA, NAVY
45	GENERAL ELECTRIC CO.
45	TELEFONAKTIEBOLAGET LM ERICSSON
43	HITACHI, LTD.
33	TEXAS INSTRUMENTS, INC.
33	VICTOR CO. OF JAPAN, LTD.
32	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
31	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
31	XEROX CORP.
30	RCA CORP.
25	NIPPON GAKKI SEIZO K.K.
25	TOKYO SHIBAURA ELECTRIC CO., LTD.
25	WESTINGHOUSE ELECTRIC CORP.
23	UNITED STATES OF AMERICA, ARMY
21	AUTOMATIC ELECTRIC LABORATORIES INC.
20	GTE SYLVANIA INC.
20	SHARP K.K.
20	WESTERN ELECTRIC CO., INC.
18	ELECTRO-VOICE, INC.
17	IWATSU ELECTRIC CO., LTD.
17	THOMSON-CSF
17	ZENITH RADIO CORP.
16	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
16	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
16	T.A.D. AVANTI INC.
15	GENERAL ELECTRIC CO. LTD.
15	HARRIS CORP.
15	NIPPON COMMUNICATION INDUSTRIAL CO. LTD.
14	AUDICHRON CO.
14	CBS INC.
14	FORD AEROSPACE & COMMUNICATIONS CORP.
14	INDUSTRIAL RESEARCH PRODUCTS INC.
13	AMERICAN TELEPHONE AND TELEGRAPH INC.
13	MAGNAVOX CO.
13	POST OFFICE
12	BOSE CORP.
12	IWASAKI TSUSHINKI K.K.
11	OLYMPUS OPTICAL CO., LTD.
11	ALTEC CORP.
11	COMMUNICATIONS SATELLITE CORP.
11	KOSS CORP.
11	KUREHA KAGAKU KOGYO K.K.
11	MINNESOTA MINING AND MANUFACTURING CO.
11	RICOH CO., LTD.
11	ROCKWELL INTERNATIONAL CORP.
11	SUPERIOR CONTINENTAL CORP.
11	TEL-TONE CORP.

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2187	388	472	397	375	465	474	486	495	416	336	357	392	403	418	8061
U.S. ORIGIN	1728	302	329	268	273	321	307	337	337	277	224	229	245	243	251	5671
FOREIGN ORIGIN	459	86	143	129	102	144	167	149	158	139	112	128	147	160	167	2390
JAPAN	52	14	27	38	33	50	82	56	57	51	46	55	62	76	93	792
WEST GERMANY	95	18	20	14	9	13	11	18	17	10	11	13	15	12	16	292
UNITED KINGDOM	76	11	23	19	8	18	20	12	20	16	13	11	8	12	9	276
CANADA	33	12	17	16	20	22	18	15	11	21	9	12	15	18	9	248
FRANCE	31	3	13	9	13	9	10	10	9	9	11	17	12	10	5	171
SWEDEN	45	7	3	9	5	5	6	6	3	11	3	4	5	3	3	118
NETHERLANDS	27	4	4	5	3	8	3	6	8	5	3	4	3	8	16	107
AUSTRIA	36	5	13	8	3	2	4	1	3	3	5	2	3	3	1	92
ITALY	15	3	8	3	2	3	2	10	7	1	4	5	5	9	6	83
SWITZERLAND	14	3	5	2	1	2	4	6	7	7	4	2	6	2		65
BELGIUM	13	2	3	2			1	2		2				1		26
AUSTRALIA	4				1			1	2	1			4	1	1	15
DENMARK	4			1	1			1	3		2				1	13
U.S.S.R.						3			4	1		2				10
NORWAY	2		1	1				2	1		1					8
ARGENTINA	1		1			2			1						3	8
ISRAEL	1		2				1						2		1	7
CHINA(TAIWAN)							1	1					3	1	1	7
CZECHOSLOVAKIA	1	1	2				1									5
GREECE		1			1	2								1		5
HUNGARY						1	1		2							4
HONG KONG													3	1		4
FINLAND						2			1							3
S. AFRICA	2						1									3
BRAZIL							1	1	1							3
BULGARIA													1		1	2
MEXICO	1	1														2
LEBANON	1	1														2
INDIA	1			1												2
THAILAND															1	1
CHINA P.REP.						1										1
COLOMBIA										1						1
CHILE												1				1
COSTA RICA	1															1
SOUTH KOREA														1		1
OTHER(11)	3		1	1	2	1		1	1					1		11
U.S. ORIGIN	1728	302	329	268	273	321	307	337	337	277	224	229	245	243	251	5671
U.S. CORP. OWNED	1286	231	252	202	201	223	207	240	249	186	153	156	170	164	191	4111
U.S. GOVT. OWNED	27	5	11	4	7	6	14	8	5	2	6	8	4	4	5	116
U.S. INDIV. OWNED	412	65	62	58	64	89	82	88	82	85	64	63	65	71	54	1404
FOREIGN OWNED	3	1	4	4	1	3	4	1	1	4	1	2	6	4	1	40
FOREIGN ORIGIN	459	86	143	129	102	144	167	149	158	139	112	128	147	160	167	2390
U.S. OWNED	122	25	39	25	13	27	20	25	15	16	5	21	9	16	17	395
FOREIGN OWNED	337	61	104	104	89	117	147	124	143	123	107	107	138	144	150	1995
FOREIGN CORP.	253	48	86	84	76	92	127	102	115	102	91	86	112	128	128	1630
FOREIGN GOVT.	5		3			1	1	1		3	1	4	4	4	1	28
FOREIGN INDIV.	79	13	15	20	13	24	19	21	28	18	15	17	22	12	21	337

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2002	345	359	382	406	440	442	453	385	463	421	476	258	31		6863
U.S. ORIGIN	1518	243	255	254	273	291	300	308	263	290	263	277	162	17		4714
FOREIGN ORIGIN	484	102	104	128	133	149	142	145	122	173	158	199	96	14		2149
JAPAN	82	29	40	45	59	51	64	51	46	71	71	94	55	10		768
WEST GERMANY	97	9	4	9	15	18	13	17	5	17	20	16	9			249
UNITED KINGDOM	64	19	8	18	13	18	14	14	18	17	9	14	4			230
CANADA	50	7	19	21	21	16	7	17	15	14	18	20	7	1		233
FRANCE	33	11	10	10	4	11	9	10	10	21	10	13	2	1		155
SWEDEN	28	8	4	5	5	5	4	6	7	6	6	3	1	1		89
NETHERLANDS	22	3	5	4	5	5	7	3	6	4	3	17	6	1		91
AUSTRIA	36	9	3	1	2	4	3	3	4	4	2	3	1			75
ITALY	17	2	3	3	2	7	7	3	4	8	4	8	6			74
SWITZERLAND	15		2	1	4	5	5	10	3	2	4	3				54
BELGIUM	14					3		1	1			1				20
AUSTRALIA	3	1				1		3		2	3	1				14
DENMARK	3	1			1		2	1	2				1			11
U.S.S.R.	1		2				1	4		2						10
NORWAY	3	1				1	2			1						8
ARGENTINA	2			2			1					2	1			8
ISRAEL	2			1							2		1			6
CHINA(TAIWAN)						2					3	1	1			7
CZECHOSLOVAKIA	4				1											5
GREECE	1		1	2							1					5
HUNGARY				2			1	1								4
HONG KONG										3		1				4
FINLAND				2				1								3
S. AFRICA					1											1
BRAZIL				1		1	1									3
BULGARIA											1		1			2
MEXICO	1															1
LEBANON	1															1
INDIA	1	1										1				2
THAILAND																1
CHINA P.REP.				1												1
COLOMBIA									1							1
CHILE										1						1
COSTA RICA											1					1
SOUTH KOREA												1				1
OTHER(11)	4	1	3			1	1									11
U.S. ORIGIN	1518	243	255	254	273	291	300	308	263	290	263	277	162	17		4714
U.S. CORP. OWNED	1160	187	180	182	180	193	225	219	192	188	186	188	130	10		3420
U.S. GOVT. OWNED	38	5	8	7	8	9	6	4	2	3	5	5	4			104
U.S. INDIV. OWNED	313	48	66	63	80	89	66	83	67	97	65	81	27	7		1152
FOREIGN OWNED	7	3	1	2	5		3	2	2	2	7	3	1			38
FOREIGN ORIGIN	484	102	104	128	133	149	142	145	122	173	158	199	96	14		2149
U.S. OWNED	143	10	11	26	16	27	15	14	11	18	13	24	7	2		337
FOREIGN OWNED	341	92	93	102	117	122	127	131	111	155	145	175	89	12		1812
FOREIGN CORP.	274	74	80	82	97	104	102	108	93	123	120	151	81	10		1499
FOREIGN GOVT.	4	1		1	1		1		5	5	3	4				25
FOREIGN INDIV.	63	17	13	19	19	18	24	23	13	27	22	20	8	2		288

1.1 TELEPHONY: SUBSCRIBER AND SUBSTATION EQUIPMENT INCLUDING KEY TELEPHONE SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	3777
TOTAL REFERENCES CITED	22133
U.S. Patent References Cited	19192
Foreign Patent References Cited	1685
Other References Cited	1256

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	11617
Japan	1465
Canada	565
United Kingdom	547
West Germany	404

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,932,709, General Teletronics Inc.	26
3,760,121, Electronics Arrays, Inc.	21
3,641,496, Phonplex Corp.	21
3,790,720, Northern Telecom Ltd.	20
3,843,845, Northern Telecom Ltd.	19

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	1470
GTE Automatic Electric Laboratories, Inc.	300
International Standard Electric Corp.	244
International Telephone & Telegraph Corp.	234
Northern Telecom Ltd.	228

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

DEFINITION

This profile includes "central office type" circuits and systems which are used to interconnect subscribers in two-way communication. Specifically excluded are strictly local two-way systems such as intercom, party line, key telephone, and conference systems which are in Profile 1.1. Examples of circuits and systems in this profile are:

Central registers
Automatic number identifiers
Traffic "peg counters"
Switching systems
"Special" features
Operator circuits and switchboards
Repeaters
Testing devices.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 1.2 are:

U.S. Patent 4,284,852. This patent illustrates an alternate routing scheme which uses clusters of telephone switching offices.

U.S. Patent 4,310,726. This patent discloses a method for identifying a caller at an emergency call location such as a "911" network.

U.S. Patent 4,348,554. This invention provides businesses with desirable features such as WATS and dedicated inter-office networks in an economical fashion.

U.S. Patent 4,421,955. This invention is an example of the current trend toward distributed switching systems. These systems give enhanced flexibility of design and greater reliability since the failure of any one unit does not disable the system.

United States Patent [19]

Szybicki et al.

[11] **4,284,852**

[45] **Aug. 18, 1981**

[54] **ALTERNATE ROUTING FOR A TELEPHONE SYSTEM**

[75] Inventors: **Edmund Szybicki**, Verdun; **Maurice E. Lavigne**, Orleans, both of Canada

[73] Assignee: **Northern Telecom Limited**, Montreal, Canada

[21] Appl. No.: **67,542**

[22] Filed: **Aug. 17, 1979**

[30] **Foreign Application Priority Data**

Jun. 22, 1979 [CA] Canada 330426

[51] **Int. Cl.**³ **H04Q 3/54**

[52] **U.S. Cl.** ..... **179/18 EA**

[58] **Field of Search** ..... **179/18 EA**

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,525,814	8/1970	Cox	179/18 ES
3,560,663	2/1971	Lee et al.	179/18 EA
3,591,724	7/1971	Yaku et al.	179/18 EA
3,705,523	12/1972	Alouisa	179/18 EA
3,916,124	10/1975	Joel, Jr.	179/18 GE

FOREIGN PATENT DOCUMENTS

1487956	7/1973	Fed. Rep. of Germany	179/18 EA
1078302	8/1967	United Kingdom	179/18 EA

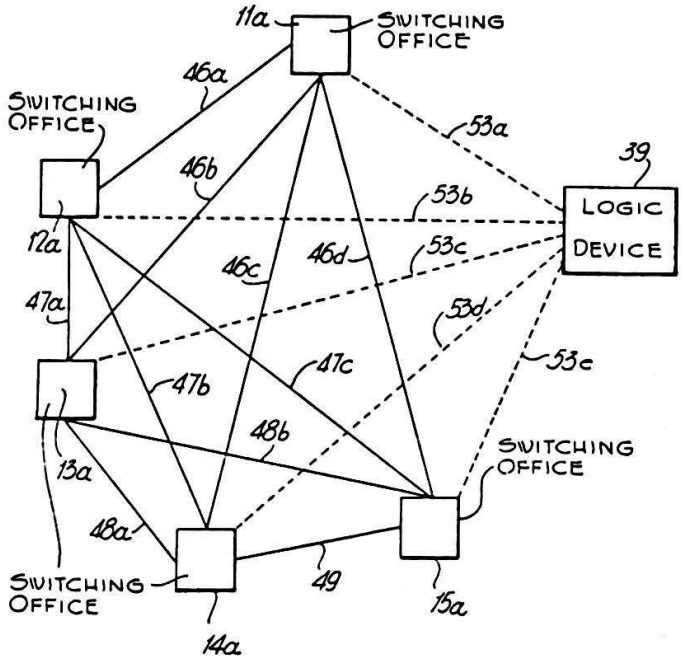
Primary Examiner—Thomas W. Brown

Attorney, Agent, or Firm—Robert C. Hogeboom

[57] **ABSTRACT**

An alternate routing scheme for a telephone system wherein a plurality of switching offices are grouped into a cluster, with each switching office in the cluster having direct trunk lines to all the other switching offices in its cluster. This allows each switching office in the cluster to serve the dual function both of an originating (or terminating) office and of a tandeming office for its own cluster. Suitable equipment monitors the busy status of all the switching offices in the cluster, and determines a most likely alternate routing scheme for each switching office. The alternate routing scheme for each particular switching office is stored at that particular office and is periodically updated, by suitable equipment, so as to account for changes in the busy status of the other switching offices and trunk lines in the cluster.

14 Claims, 6 Drawing Figures



United States Patent [19]

Asmuth

[11] **4,310,726**

[45] **Jan. 12, 1982**

[54] **METHOD OF IDENTIFYING A CALLING STATION AT A CALL TERMINATING FACILITY**

[75] Inventor: **Richard L. Asmuth**, Oldbridge, N.J.

[73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J.

[21] Appl. No.: **117,828**

[22] Filed: **Feb. 4, 1980**

[51] **Int. Cl.**³ **H04M 3/42**; H04M 7/06; H04Q 3/72

[52] **U.S. Cl.** ..... **179/18 B**; 179/5.5; 179/18 FH

[58] **Field of Search** ..... 179/18 FM, 5.5, 18 B, 179/18 D, 18 C, 18 BF, 18 BC, 18 BA; 370/62, 61

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,412,211	11/1968	Abert et al.	179/18 FH
3,597,544	8/1971	Kennedy	179/18 C X
3,641,276	2/1972	Keller et al.	179/18 BF
3,881,060	4/1975	Connell et al.	179/5.5
4,162,377	7/1979	Mearns	179/18 D
4,191,860	3/1980	Weber	179/18 B

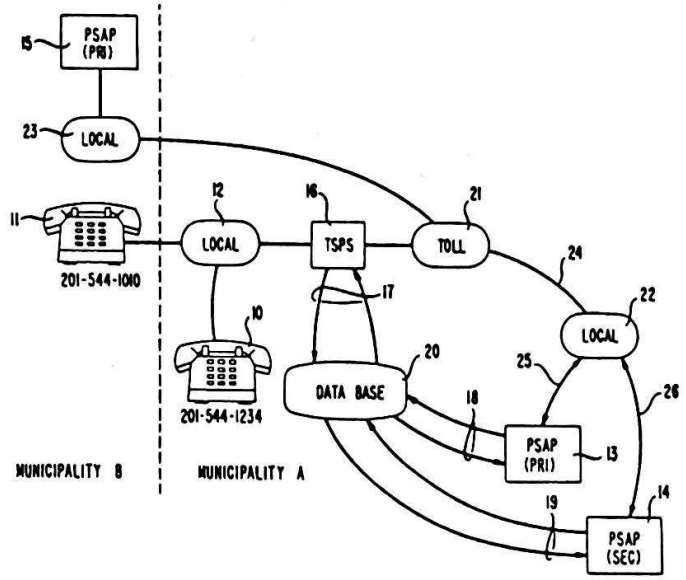
Primary Examiner—Thomas W. Brown

Attorney, Agent, or Firm—F. W. Padden

[57] **ABSTRACT**

A method is disclosed illustratively in an emergency call handling system for automatically providing the identity of a calling station to a call terminating facility, such as a call answering bureau. In response to an appropriate call, a data base is accessed where a fictitious telephone number is temporarily assigned to the call. The calling station identity is stored at the data base with the assigned number. The call is completed over conventional facilities to the call terminating facility using the assigned number. In response to the call directed to the fictitious number, the data base is accessed with the fictitious number to obtain the calling station's identity.

8 Claims, 5 Drawing Figures



United States Patent [19]

Asmuth

[11] **4,348,554**

[45] **Sep. 7, 1982**

[54] **METHOD OF PROVIDING VIRTUAL PRIVATE NETWORK TELEPHONE SERVICE**

[75] Inventor: **Richard L. Asmuth, Oldbridge, N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **132,534**

[22] Filed: **Mar. 21, 1980**

[51] Int. Cl.³ **H04M 3/42; H04M 7/00; H04M 15/00**

[52] U.S. Cl. ..... **179/18 B; 179/8 A; 179/18 DA; 179/18 EA**

[58] Field of Search ..... **179/18 EA, 18 C, 18 B, 179/18 ES, 8 A, 18 DA, 18 D, 18 AG**

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,150,236	9/1964	Gorgas et al.	179/18 E
3,157,743	11/1964	Avery	179/8 A
3,188,396	6/1965	MacFarlane	179/18 AH
3,309,467	3/1967	Gorgas et al.	179/18 EA
3,749,845	7/1973	Fraser	179/18 EA X
3,760,105	9/1973	Puccini	179/8 A

OTHER PUBLICATIONS

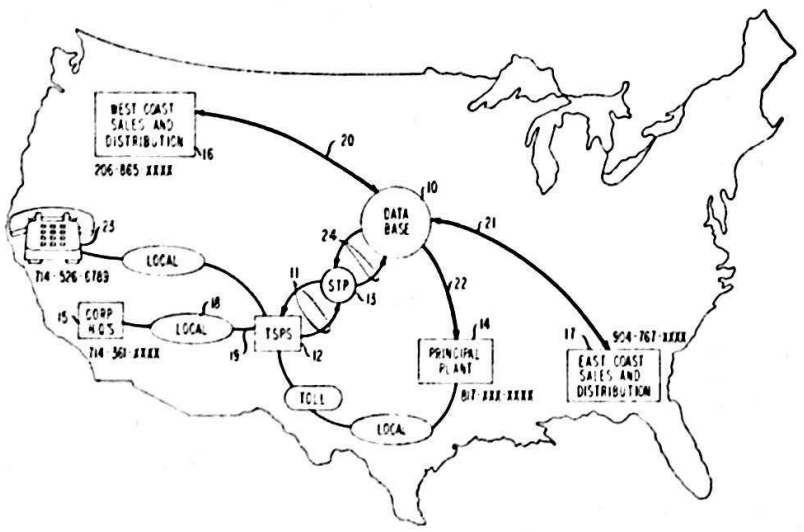
"A Sophisticated Switched Service", Katz et al., *Bell Laboratories Record*, Feb. 1979, pp. 38-45; Modifying No. 1 ESS for Enhanced Private Network Service, Anderson and Lambert, *Bell Laboratories Record*, Feb. 1979, pp. 46-52.

Primary Examiner—Thomas W. Brown
Attorney, Agent, or Firm—J. W. Herndon

[57] **ABSTRACT**

A method is disclosed for providing private network types of telephone services via the public switched network without having it provide private hardware facilities. The method is described with respect to a telephone system comprising plural telephone stations and offices, a data base, and a data communications network connecting some of the offices to the data base. Information is stored at the data base defining a virtual private network. The information includes a description of the bounds of the virtual network and its capacity in terms of virtual telephone facility resources of a prescribed type. In response to a call directed to the virtual network, a verification is made at the data base that this call is entitled to complete via the virtual network and that an idle virtual resource is available for assignment to the call. The idle resource is assigned to the call, and the call is completed via the public switched network.

28 Claims, 13 Drawing Figures



United States Patent [19]

Mori et al.

[11] **4,421,955**

[45] **Dec. 20, 1983**

[54] **DISTRIBUTED SWITCHING SYSTEM**

[75] Inventors: **Hiromichi Mori, Kawasaki; Jun Matsumoto, Tama; Masanobu Fujioka, Tokyo, all of Japan**

[73] Assignee: **Kokusai Denshin Denwa Kabushiki Kaisha, Tokyo, Japan**

[21] Appl. No.: **296,616**

[22] Filed: **Aug. 27, 1981**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 147,899, May 8, 1980, abandoned

[30] **Foreign Application Priority Data**

Jul. 20, 1979 [JP] Japan **54-91637**

[51] Int. Cl.³ **H04Q 3/42**

[52] U.S. Cl. ..... **179/18 EA; 179/18 ES**

[58] Field of Search ..... **179/18 ES, 18 EA; 370/67, 66, 68, 86, 88**

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,064,486	12/1977	Faber	370/86 X
4,071,701	1/1978	Lejonhufvud et al.	370/66
4,168,401	9/1979	Molleron et al.	370/66
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4,210,782	7/1980	Fujita	179/18 ES
4,228,536	10/1980	Gueldenpfennig et al.	370/66

FOREIGN PATENT DOCUMENTS

53-129907	11/1978	Japan	179/18 ES
1441613	7/1976	United Kingdom	179/18 ES
588657	1/1978	U.S.S.R.	179/18 ES

OTHER PUBLICATIONS

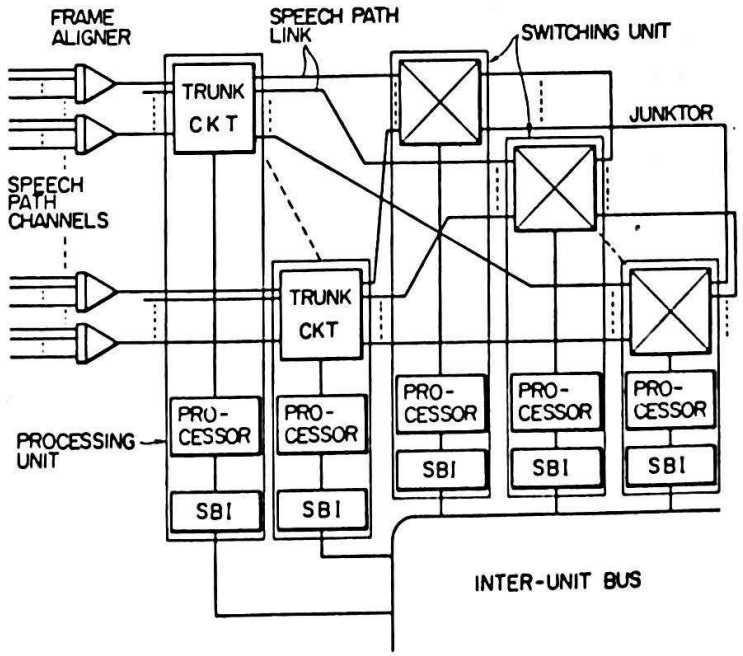
"Design Approaches and Peformance Criteria for Integrated Voice/Data Switching", by Ross et al., *Proceedings of the IEEE*, vol. 65, No. 9, Sep. 1977, pp. 1283-1295.
"Interprocessor Communication in Systems with Distributed Control", by Jovic et al., *Proceedings of the IEEE*, vol. 65, No. 9, Sep. 1977, pp. 1323-1329.

Primary Examiner—Thomas W. Brown
Attorney, Agent, or Firm—Pollock, Vande Sande & Priddy

[57] **ABSTRACT**

A distributed switching system is disclosed which includes a plurality of simple-function switching units interconnected by speech path links, each unit having a speech-path switch, a plurality of processing units connected to speech-paths for use in signal and call processing, and an inter-unit bus for the connection between the switching units and the processing units, and functions as a single large switching system as a whole.

4 Claims, 21 Drawing Figures



1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

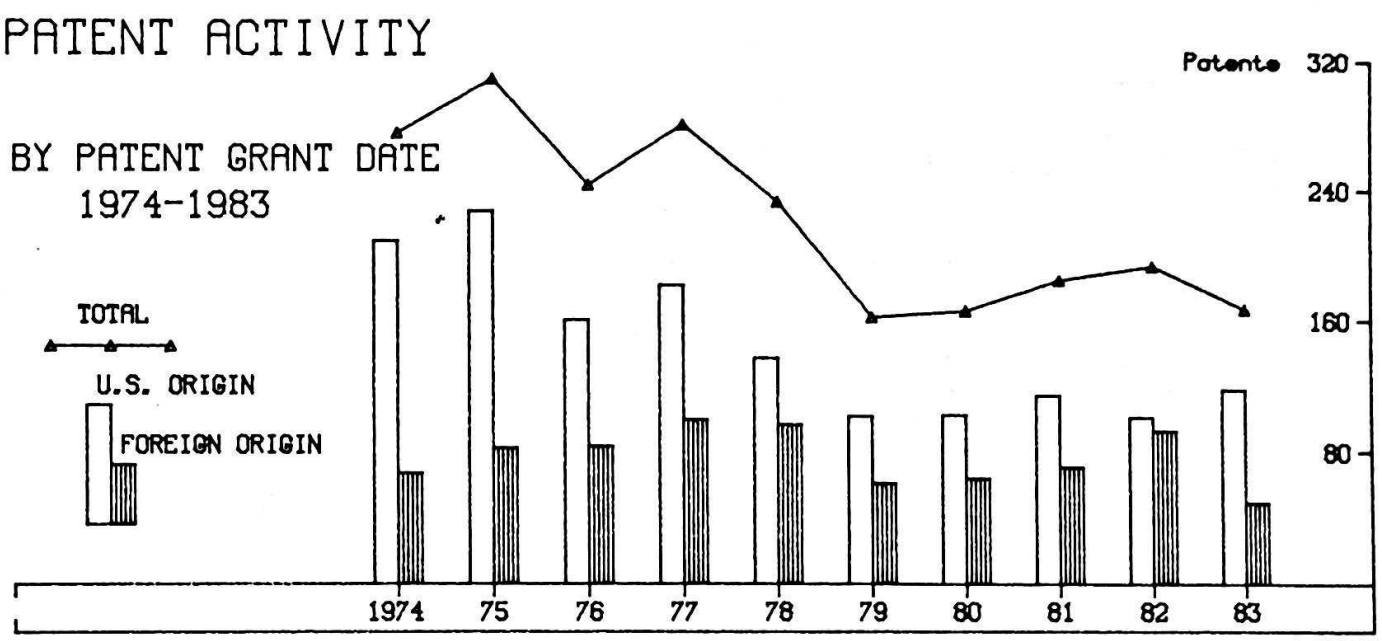
ACTIVITY SUMMARY

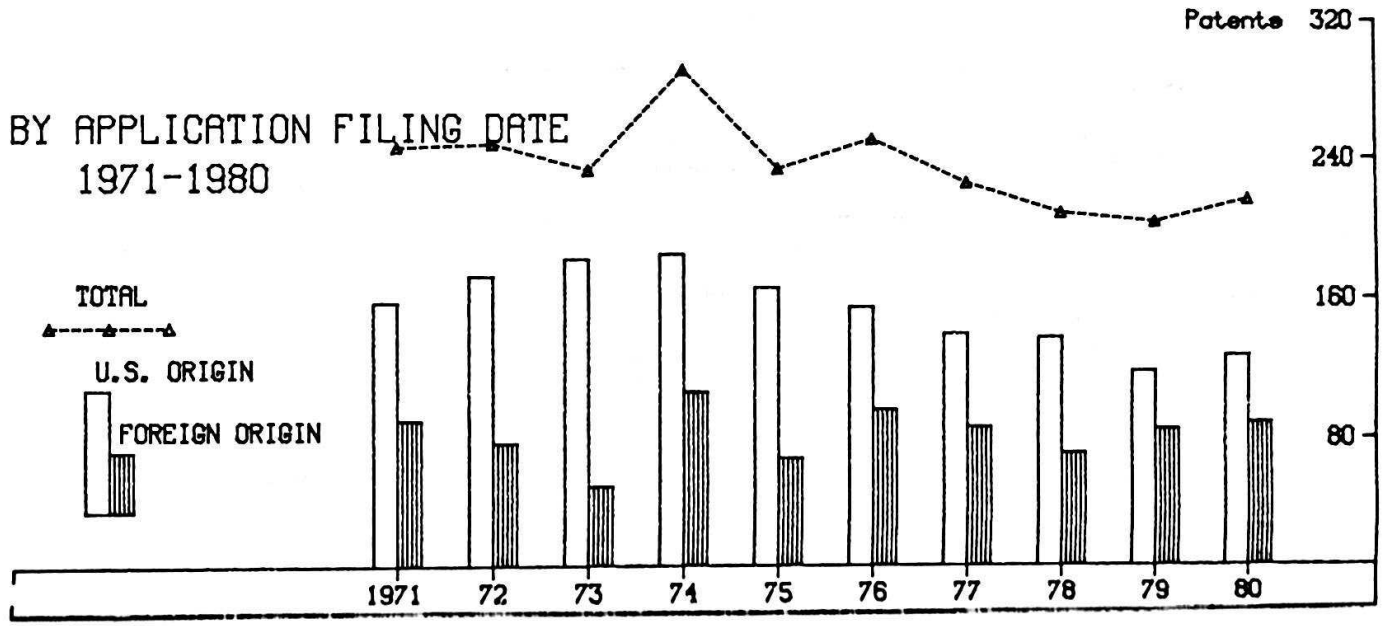
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	24.7%
FOREIGN SHARE	39.0%
CORPORATE OWNED	90.6%
GOVERNMENT OWNED	0.9%
U.S. OWNED OF FOREIGN	15.2%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 179, Subclasses 8R-10, 16R-16H, 18R-27DB, 27F-27H, 41R-80, 91R-98, 170R-177





1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

ORGANIZATIONS ASSIGNED 7 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
669	BELL TELEPHONE LABORATORIES, INC.
225	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
210	INTERNATIONAL STANDARD ELECTRIC CORP.
150	STROMBERG-CARLSON CORP.
140	SIEMENS AG.
122	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
67	NORTHERN TELECOM LTD.
60	U.S. PHILIPS CORP.
52	HITACHI, LTD.
45	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
40	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
39	NIPPON ELECTRIC CO., LTD.
37	INTERNATIONAL BUSINESS MACHINES CORP.
37	TELEFONAKTIEBOLAGET LM ERICSSON
34	AMERICAN TELEPHONE AND TELEGRAPH INC.
30	AUTOMATIC ELECTRIC LABORATORIES INC.
28	WESTERN ELECTRIC CO. INC.
26	LORAIN PRODUCTS CORP.
25	PORTA SYSTEMS CORP.
24	GTE SYLVANIA INC.
22	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
21	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
20	POST OFFICE
19	COMMUNICATIONS SATELLITE CORP.
19	KOKUSAI DENSHIN DENWA K.K.
17	WESCOM, INC.
15	MITEL CORP.
15	RCA CORP.
14	NORTH ELECTRIC CO.
14	PLESSEY HANDEL UND INVESTMENTS AG.
13	GENERAL ELECTRIC CO.
13	K. K. MARUTO SEISAKUSHO
12	TRW INC.
11	BELL CANADA-NORTHERN ELECTRIC RESEARCH LTD.
11	COMMUNICATION MFG. CO.
10	FUJITSU LTD.
10	GTE AUTOMATIC ELECTRIC (CANADA) LTD.
10	ROCKWELL INTERNATIONAL CORP.
10	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
10	TOKYO SHIBAURA ELECTRIC CO., LTD.
10	UNITED STATES OF AMERICA, NAVY
9	LYNCH COMMUNICATIONS SYSTEMS INC.
9	MAGNETIC CONTROLS CO.
9	MOTOROLA INC.
9	SIEMENS CORP.
9	SOCIETE ANONYME DE TELECOMMUNICATIONS
9	TII INDUSTRIES, INC.
8	BELL TELEPHONE CO. OF CANADA
8	GTE INTERNATIONAL, INC.
8	RELIABLE ELECTRIC CO.
8	SUPERIOR CONTINENTAL CORP.
8	TEL-TONE CORP.
8	WESCOM SWITCHING, INC.
7	ASSOCIATED ELECTRICAL INDUSTRIES LTD.
7	BURROUGHS CORP.
7	COOK ELECTRIC CO.
7	GENERAL ELECTRIC CO. LTD.
7	GENERAL TELEPHONE CO. OF CALIFORNIA
7	NIPPON COMMUNICATION INDUSTRIAL CO. LTD.
7	SAN/BAR CORP.

1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1297	335	267	256	280	272	305	240	277	230	160	164	183	192	166	4624
U.S. ORIGIN	895	187	178	162	174	206	224	158	179	135	100	101	113	100	117	3029
FOREIGN ORIGIN	402	148	89	94	106	66	81	82	98	95	60	63	70	92	49	1595
WEST GERMANY	106	61	14	19	22	10	13	8	12	9	9	8	15	15	9	330
FRANCE	42	10	29	18	18	9	16	20	17	22	11	13	11	22	7	265
JAPAN	25	11	9	10	13	11	16	18	23	15	14	16	16	9	16	222
UNITED KINGDOM	90	17	12	7	10	3	14	8	8	15	5	4	4	9	2	208
CANADA	20	13	4	18	22	14	8	12	15	12	10	11	14	12	7	192
ITALY	6	4	8	9	8	11	3	8	11	8	7	4	3	8	2	100
SWEDEN	53	13	3	5	3	2	2	4	4	3	1					93
NETHERLANDS	22	5	2	3	4	2	3		2	3	2	4	3	11	4	70
BELGIUM	24	8	7	2	2		4	1	2			1	1		1	53
SWITZERLAND	5			1			1		3	6		1		1		18
AUSTRALIA	3	2			2	1		1		1			2			12
DENMARK	2	1								1				2		6
ISRAEL		1						2						1		4
U.S.S.R.		1	1				1									3
AUSTRIA	2	1												1		2
GREECE						1										2
NORWAY				2										1		2
SPAIN						1								1		2
ARGENTINA	1								1						1	2
MALAYSIA										1						1
HUNGARY											1					1
INDONESIA	1															1
IRAN					1											1
FINLAND												1				1
SOUTH KOREA					1											1
ROMANIA						1										1
MALAWI													1			1
U.S. ORIGIN	895	187	178	162	174	206	224	158	179	135	100	101	113	100	117	3029
U.S. CORP. OWNED	814	160	152	154	155	182	205	142	156	110	86	83	103	88	105	2695
U.S. GOVT. OWNED	14	6	3	2	4	2			3	1		1		1		37
U.S. INDIV. OWNED	64	20	21	5	14	21	16	15	20	14	13	12	10	7	12	264
FOREIGN OWNED	3	1	2	1	1	1	3	1		10	1	5		4		33
FOREIGN ORIGIN	402	148	89	94	106	66	81	82	98	95	60	63	70	92	49	1595
U.S. OWNED	157	65	41	25	24	24	29	12	13	12	10	8	9	18	5	452
FOREIGN OWNED	245	83	48	69	82	42	52	70	85	83	50	55	61	74	44	1143
FOREIGN CORP.	217	68	30	61	71	40	45	63	79	72	47	46	56	63	39	997
FOREIGN GOVT.	6	1	1		2				1	6	1	5	1	2	1	27
FOREIGN INDIV.	22	14	17	8	9	2	7	7	5	5	2	4	4	9	4	119

1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1256	203	245	247	232	290	233	250	225	208	203	216	119	6		3933
U.S. ORIGIN	781	131	156	171	181	184	165	154	139	137	118	127	79	4		2527
FOREIGN ORIGIN	475	72	89	76	51	106	68	96	86	71	85	89	40	2		1406
WEST GERMANY	152	14	17	11	5	14	8	10	11	11	15	16	6	1		291
FRANCE	64	19	11	18	10	23	11	18	19	15	14	19	8			249
JAPAN	45	3	13	9	12	23	14	22	15	15	20	14	8	1		214
UNITED KINGDOM	62	4	11	5	5	13	8	9	13	4	6	6	3			149
CANADA	27	14	22	13	9	15	6	17	11	13	16	12	7			182
ITALY	18	7	6	11	3	5	11	8	8	7	4	4	5			97
SWEDEN	43	3	2	2	2	3	4	3	3							65
NETHERLANDS	20	2	4	2	2	2	2	1	3	4	3	13	3			61
BELGIUM	26	3		1	2	4	2				1	1				40
SWITZERLAND	4	1				1	1	6	2	1		1				17
AUSTRALIA	3	1	1	1	1			1			2					10
DENMARK	3							1				2				6
ISRAEL	1					2					1					4
U.S.S.R.	2		1			1		1								5
AUSTRIA	2															2
GREECE				1							1					2
NORWAY	1	1														2
SPAIN				1							1					2
ARGENTINA	1											1				2
MALAYSIA							1									1
HUNGARY									1							1
INDONESIA	1															1
IRAN			1													1
FINLAND										1						1
SOUTH KOREA				1												1
ROMANIA			1													1
MALAWI											1					1
U.S. ORIGIN	781	131	156	171	181	184	165	154	139	137	118	127	79	4		2527
U.S. CORP. OWNED	693	125	142	156	158	169	147	132	116	111	108	114	70	3		2244
U.S. GOVT. OWNED	14	2	4	1	1			3	2			1				28
U.S. INDIV. OWNED	70	3	10	14	18	15	17	17	13	20	9	10	8	1		225
FOREIGN OWNED	4	1			4		1	2	8	6	1	2	1			30
FOREIGN ORIGIN	475	72	89	76	51	106	68	96	86	71	85	89	40	2		1406
U.S. OWNED	204	23	12	32	19	23	10	10	13	9	10	21	3			389
FOREIGN OWNED	271	49	77	44	32	83	58	86	73	62	75	68	37	2		1017
FOREIGN CORP.	220	42	68	37	29	73	53	79	64	53	67	60	33	2		880
FOREIGN GOVT.	6		2				1	4	3	6		2	1			25
FOREIGN INDIV.	45	7	7	7	3	10	4	3	6	3	8	6	3			112

1.2 TELEPHONY: CENTRAL OFFICE EQUIPMENT, SWITCHING SYSTEMS, REPEATERS, AND TESTING SYSTEMS AND DEVICES

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1917
TOTAL REFERENCES CITED	13438
U.S. Patent References Cited	12445
Foreign Patent References Cited	459
Other References Cited	534

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	5891
Japan	410
Canada	409
France	395
West Germany	345

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,530,260, Bell Telephone Laboratories, Inc.	18
4,004,109, Unassigned	16
3,855,430, International Standard Electric Corp.	16
4,041,252, North Electric Co.	15
4,074,072, Bell Telephone Laboratories, Inc.	14

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	1450
GTE Automatic Electric Laboratories, Inc.	395
International Standard Electric Corp.	330
Stromberg-Carlson Corp.	250
International Telephone & Telegraph Corp.	211

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

2.0 LIGHT WAVE COMMUNICATIONS

CONTENTS

2.0 LIGHT WAVE COMMUNICATIONS

INTRODUCTION

Light wave communications use that part of the electromagnetic spectrum in or near the visible region. This portion of the spectrum includes the infrared and ultraviolet wavelengths. The characteristics of light can be used in a number of ways to transmit information. One way is to modulate the intensity of a light source in accordance with an input signal. Another is to use a source which produces light of a single frequency as a carrier wave generator. With this type of source the use of standard modulation techniques, such as amplitude modulation (AM) and frequency modulation (FM), is possible. As with other communication systems, time and frequency division techniques may be employed to transmit information from more than one source.

In light communication systems, the light signal is usually transmitted as line of sight transmission or via optical fibers. The use of the latter permits the transmission of light around curves or to otherwise inaccessible places.

The laser, which produces a collimated, highly directional light ray with high optical power density, is an ideal signal source for optical communications.

2.0 LIGHT WAVE COMMUNICATIONS

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	31.8%
FOREIGN SHARE	48.5%
CORPORATE OWNED	86.3%
GOVERNMENT OWNED	6.7%
U.S. OWNED OF FOREIGN	12.9%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 350, Subclasses 96.1-96.34

Class 357, Subclasses 17, 19

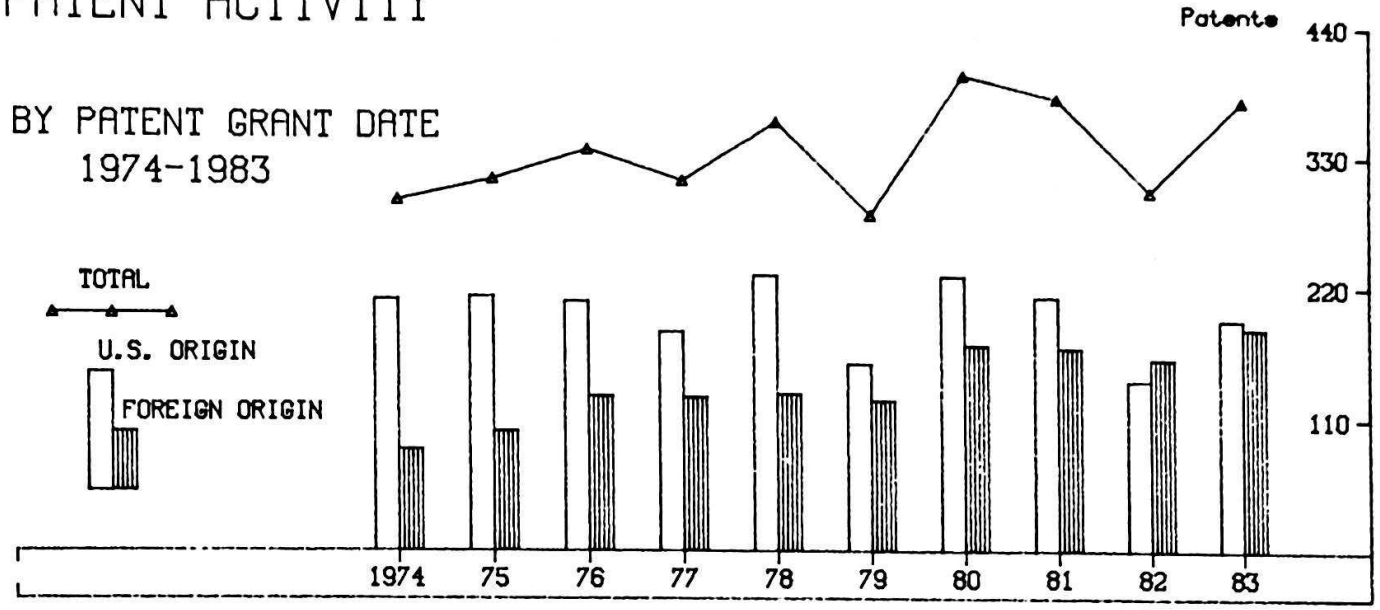
Class 370, Subclasses 1-4

Class 372, Subclasses 43-50, 75

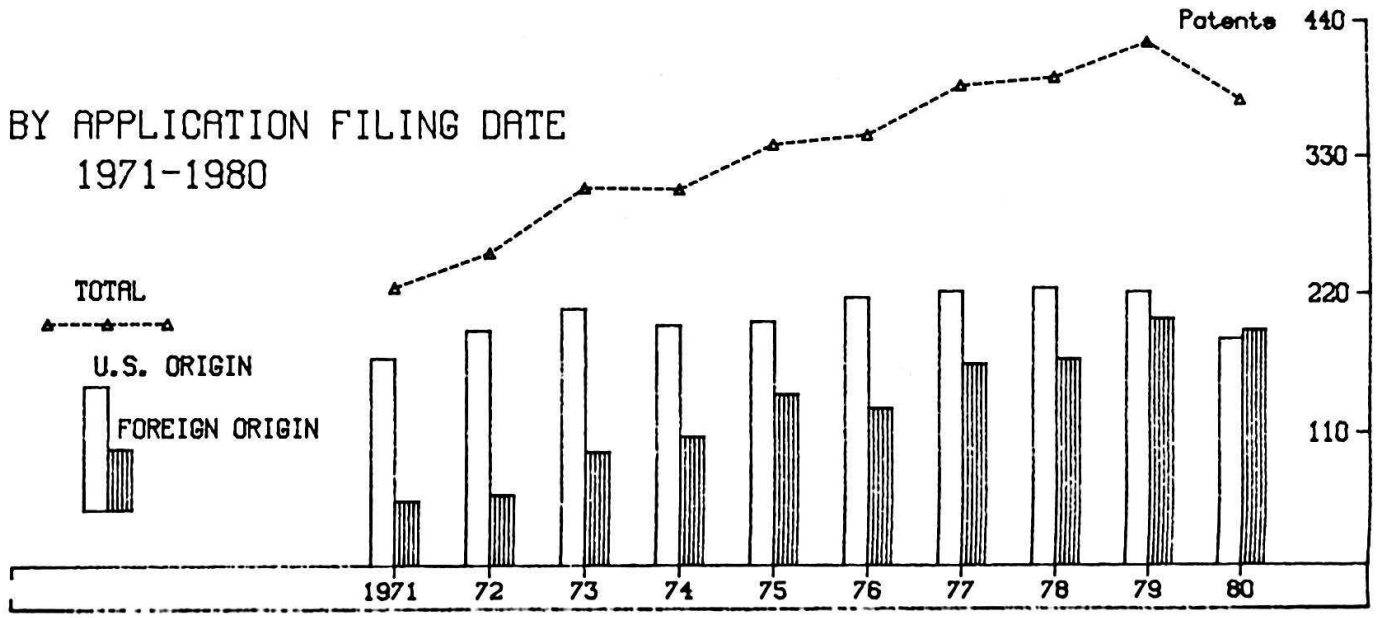
Class 455, Subclasses 600-619

PATENT ACTIVITY

BY PATENT GRANT DATE
1974-1983



BY APPLICATION FILING DATE
1971-1980



2.0 LIGHT WAVE COMMUNICATIONS

ORGANIZATIONS ASSIGNED 13 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
521	BELL TELEPHONE LABORATORIES, INC.
158	SIEMENS AG.
148	UNITED STATES OF AMERICA, NAVY
130	RCA CORP.
128	INTERNATIONAL BUSINESS MACHINES CORP.
101	U.S. PHILIPS CORP.
97	CORNING GLASS WORKS
91	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
86	THOMAS-CSF
82	INTERNATIONAL STANDARD ELECTRIC CORP.
80	AMERICA OPTICAL CORP.
78	HITACHI, LTD.
75	XEROX CORP.
68	GENERAL ELECTRIC CO.
65	UNITED STATES OF AMERICA, ARMY
64	HUGHES AIRCRAFT CO.
57	NIPPON ELECTRIC CO., LTD.
57	TEXAS INSTRUMENTS, INC.
52	OLYMPUS OPTICAL CO., LTD.
48	NORTHERN TELECOM LTD.
47	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
47	WESTINGHOUSE ELECTRIC CORP.
42	GTE LABORATORIES INC.
40	NIPPON SELFOC CO., LTD.
36	AMP INC.
35	SPERRY CORP.
33	UNITED STATES OF AMERICA, AIR FORCE
32	TOKYO SHIBAURA ELECTRIC CO., LTD.
28	PLESSEY HANDEL UND INVESTMENTS AG.
25	MASSACHUSETTS INSITUTE OF TECHNOLOGY
25	POST OFFICE
24	KOKUSAI DENSHIN DENWA K.K.
24	MOTOROLA INC.
24	ROCKWELL INTERNATIONAL CORP.
23	LICENTIA PATENT-VERWALTUNGS-GMBH
23	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
20	GENERAL MOTORS CORP.
20	UNITED TECHNOLOGIES CORP.
19	BENDIX CORP.
18	HARRIS CORP.
18	HEWLETT-PACKARD CO.
18	HONEYWELL INC.
18	MONSANTO CO.
18	UNITED STATES OF AMERICA, NASA
17	OWENS-CORNING FIBERGLAS CORP.
17	SUMITOMO ELECTRIC INDUSTRIES, LTD.
16	BICC LTD.
16	BUNKER RAMO CORP.
15	EASTMAN KODAK CO.
15	TRW INC.
14	CANON K.K.
14	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
14	MINNESOTA MINING AND MANUFACTURING CO.
14	NATIONAL RESEARCH DEVELOPMENT CORP.
14	ZENITH RADIO CORP.
13	COMPAGNIE GENERALE D'ELECTRICITE
13	FUJITSU LTD.
13	GENERAL DYNAMICS CORP. POMONA DIV.
13	SANDERS ASSOCIATES INC.
13	SINGER CO.
13	WESTERN ELECTRIC CO. INC.

2.0 LIGHT WAVE COMMUNICATIONS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	912	255	334	270	284	290	307	332	306	356	278	397	378	300	377	5376
U.S. ORIGIN	812	204	247	206	223	207	209	205	180	227	154	227	210	141	192	3644
FOREIGN ORIGIN	100	51	87	64	61	83	98	127	126	129	124	170	168	159	185	1732
JAPAN	19	18	33	37	23	44	47	40	38	36	31	35	53	60	66	580
WEST GERMANY	30	9	18	10	10	18	15	21	27	28	26	30	30	33	40	345
UNITED KINGDOM	25	6	10	6	9	7	19	28	19	27	25	42	20	23	18	284
FRANCE	6	9	9	5	11	11	10	18	21	16	23	42	31	20	29	261
CANADA	6		2		2		3	9	4	8	7	6	13	10	8	78
NETHERLANDS	6	2	7	2	1		1	3	3	2	2	2	9	6	10	56
SWITZERLAND	2	3	3	3					7	3	1	3	1	3	8	37
ITALY	2	2	1		4	1		2	1	3	4	5	7	2	3	37
SWEDEN	1	1	1	1			1		2	1	1	3	3	1	1	17
U.S.S.R.						1		5	2	4	3	1				16
DENMARK											1	1	1			3
AUSTRALIA										1					1	2
EAST GERMANY							1							1		2
ISRAEL	2															2
S. AFRICA															1	1
BELGIUM			1													1
WEST INDIES							1									1
BRAZIL					1											1
CHINA P.REP.	1															1
AUSTRIA								1								1
NICARAGUA			1													1
NEW ZEALAND									1							1
BARBADOS									1							1
FINLAND			1													1
HUNGARY		1														1
IRELAND						1										1
U.S. ORIGIN	812	204	247	206	223	207	209	205	180	227	154	227	210	141	192	3644
U.S. CORP. OWNED	683	184	197	177	183	166	173	150	132	180	122	191	168	113	154	2973
U.S. GOVT. OWNED	32	7	24	5	11	16	27	37	29	31	22	17	21	11	21	311
U.S. INDIV. OWNED	94	12	25	24	29	23	9	17	18	15	9	19	20	14	15	343
FOREIGN OWNED	3	1	1			2		1	1	1	1		1	3	2	17
FOREIGN ORIGIN	100	51	87	64	61	83	98	127	126	129	124	170	168	159	185	1732
U.S. OWNED	26	10	18	4	11	8	12	11	18	26	24	31	24	15	27	265
FOREIGN OWNED	74	41	69	60	50	75	86	116	108	103	100	139	144	144	158	1467
FOREIGN CORP.	64	38	63	58	43	62	79	98	95	92	88	125	128	135	142	1310
FOREIGN GOVT.	1				1	2	2	6	2	4	4	5	5	5	7	44
FOREIGN INDIV.	9	3	6	2	6	11	5	12	11	7	8	9	11	4	9	113

2.0 LIGHT WAVE COMMUNICATIONS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1246	224	224	251	302	301	337	345	385	392	421	375	196	28		5027
U.S. ORIGIN	1006	171	168	190	207	194	197	216	221	224	221	184	107	14		3320
FOREIGN ORIGIN	240	53	56	61	95	107	140	129	164	168	200	191	89	14		1707
JAPAN	85	29	26	23	51	35	40	40	37	34	64	72	36	5		577
WEST GERMANY	56	8	10	15	18	13	32	28	29	32	41	35	20	4		341
UNITED KINGDOM	34	6	6	10	17	24	20	28	38	38	21	22	9	2		275
FRANCE	25	4	8	9	6	17	25	17	31	39	34	33	9	3		260
CANADA	5	1	1	1		9	3	7	11	10	11	12	5			76
NETHERLANDS	13	1		1	1	2	2	2	3	6	11	9	2			53
SWITZERLAND	9	2				1	5	3	3	2	3	3	6			37
ITALY	3		4	1		3	3		5	5	7	3	1			35
SWEDEN	4				1		2		2		7	1				17
U.S.S.R.			1		1	2	5	3	2	2						16
DENMARK									3							3
AUSTRALIA								1					1			2
EAST GERMANY				1							1					2
ISRAEL	1															1
S. AFRICA												1				1
BELGIUM	1															1
WEST INDIES						1										1
BRAZIL		1														1
CHINA P.REP.	1															1
AUSTRIA							1									1
NICARAGUA	1															1
NEW ZEALAND							1									1
BARBADOS							1									1
FINLAND	1															1
HUNGARY	1															1
IRELAND		1														1
U.S. ORIGIN	1006	171	168	190	207	194	197	216	221	224	221	184	107	14		3320
U.S. CORP. OWNED	852	140	145	153	167	143	157	164	177	179	186	144	84	13		2704
U.S. GOVT. OWNED	57	10	5	14	18	35	25	33	28	27	16	22	11			301
U.S. INDIV. OWNED	93	20	18	21	22	15	14	18	15	18	17	17	9	1		298
FOREIGN OWNED	4	1		2		1	1	1	1		2	1	3			17
FOREIGN ORIGIN	240	53	56	61	95	107	140	129	164	168	200	191	89	14		1707
U.S. OWNED	47	3	9	8	10	13	18	25	30	32	28	20	15			258
FOREIGN OWNED	193	50	47	53	85	94	122	104	134	136	172	171	74	14		1449
FOREIGN CORP.	177	47	40	42	76	81	106	93	121	121	156	156	66	13		1295
FOREIGN GOVT.	1		1	2	2	6	2	2	6	7	4	5	5	1		44
FOREIGN INDIV.	15	3	6	9	7	7	14	9	7	8	12	10	3			110

2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

DEFINITION

This profile includes light wave communication systems and system components. Some of the systems, such as repeaters, are specialized. Others use pulse or time and frequency division multiplexing techniques or include optical waveguides. Also included are transceivers and systems permitting one-way communication.

Transmitter and receiver circuits, specific light sources and modulation techniques for light communication systems form the system components.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 2.1 are:

U.S. Patent 4,326,298. This patent discloses a voice communication system which uses only light energy to transmit signals. This system's advantage is that operational cycles in the subscriber station remain the same as in traditional stations using electricity.

U.S. Patent 4,403,352. This is an electro-optical device. The inventor claims that by using holographic writing and reading this device is efficient and requires little energy.

U.S. Patent 4,366,565. This patent describes an optical communication system which uses angular division multiplexing. The system is designed to efficiently share a bandwidth and requires only a single fiber to interconnect stations.

U.S. Patent 4,334,321. This patent describes an opto-acoustic transducer for use in telephone receivers. By converting the light energy directly to sound, this invention eliminates the need for copper wiring in the receiver and makes the receiver more compatible with optical fiber transmission cables.

United States Patent [19]

Fromm et al.

[11] **4,326,298**

[45] **Apr. 20, 1982**

[54] **ARRANGEMENT FOR SIGNALING IN A VOICE COMMUNICATION SYSTEM WITH OPTICALLY FED COMPONENTS**

[75] Inventors: **Ingrid Fromm; Helmut Lagger**, both of Munich, Fed. Rep. of Germany

[73] Assignee: **Siemens Aktiengesellschaft**, Berlin & Munich, Fed. Rep. of Germany

[21] Appl. No.: **169,448**

[22] Filed: **Jul. 16, 1980**

[30] **Foreign Application Priority Data**

Sep. 5, 1979 [DE] Fed. Rep. of Germany 2935838

[51] Int. Cl.³ H04B 9/00

[52] U.S. Cl. 455/606; 455/607; 455/612; 455/617

[58] Field of Search 455/600, 603, 605, 606, 455/610, 612, 614, 617, 607

[56] **References Cited**

FOREIGN PATENT DOCUMENTS

2708606 8/1978 Fed. Rep. of Germany .

OTHER PUBLICATIONS

Rosenberger D., "Microoptic Passive Devices for Multimode Optical Fiber Communication Systems", Siemens Forsch-U. Entwickl.-Ber. Bd. 8, (1979) No. 3, Springer-Verlag 1979.

Winzer G., "Tapping Elements with Thin-Film Beam Splitters Directly Appl. To Optical Fiber Endfaces", Siemens Forsch-U. Entwickl.-Ber. Bd. 8, (1979), No. 1, Springer-Verlag 1979.

Winzele et al., "Reed-Type Route Switching for Multimode Optical Fibers", Siemens Forsch-U. Entwickl.-Ber. Bd. 8, (1979) No. 3, Springer-Verlag 1979.

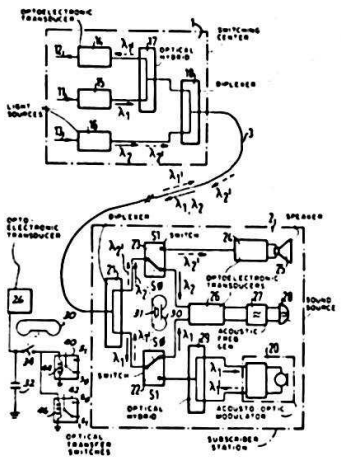
Primary Examiner—Howard Britton

Attorney, Agent, or Firm—Hill, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**

An arrangement for signaling in a voice communication system having optically fed components employs light wave guides which, in addition to serving for the transmission of the communication signals, also serve for the communication of the signals required for completing and disconnecting connections and for the transmission of energy in the form of light for the energy supply of the subscriber stations. The energy for supplying the subscriber stations is transmitted in the form of unmodulated light. The frequency of the unmodulated light deviates from the fundamental frequency of the light signal transmitted from the switching center to the subscriber station. A diplexer is arranged at the subscriber station for the incoming light and conducts the incoming modulated light to a loudspeaker by way of an optical transfer switch and an optoelectronic transducer and feeds the unmodulated light to an acousto optical modulator. In the switching center, apparatus is provided for periodically interrogating all subscriber stations with short light pulses as to their operating conditions. First and second optical transfer switches are provided in the subscriber substations and are indirectly synchronously actuatable by the subscriber, preferably by the handset. The short light pulses are absorbed by an optoelectronic transducer in the idle condition of the subscriber station and are at least partially reflected by an acousto-optical modulator in the activated condition for an outgoing call. In the case of an incoming connection, continuous light or continuous light pulsed in the call rhythm, of two frequencies is transmitted to the subscriber station for activating the call element. The short light pulses for interrogating the operating condition are dimensioned in terms of pulse length and in terms of pulse-to-pause ratio in such a manner that, on the one hand, the call element is not activated and, on the other hand, no noticeable delay of the completion of an outgoing connection occurs.

12 Claims, 2 Drawing Figures



United States Patent [19]

Huignard et al.

[11] **4,403,352**

[45] **Sep. 6, 1983**

[54] **SWITCHING DEVICE FOR OPTICAL BEAMS AND TELEPHONE EXCHANGE INCORPORATING SUCH A DEVICE**

[75] Inventors: **Jean-Pierre Huignard; Pierre Leclerc**, both of Paris, France

[73] Assignee: **Thomson-CSF**, Paris, France

[21] Appl. No.: **326,556**

[22] Filed: **Dec. 2, 1981**

[30] **Foreign Application Priority Data**

Dec. 5, 1980 [FR] France 80 25910

[51] Int. Cl.³ H04Q 3/00

[52] U.S. Cl. 455/601; 455/606; 455/612; 455/617; 250/578; 250/551; 370/1; 350/162.11; 350/169

[58] Field of Search 455/600, 601, 606, 607, 455/612, 617; 370/1, 3, 4, 74, 98; 250/551, 578; 350/162.11, 169

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,074,142 2/1978 Jackson 250/578

4,229,071 10/1980 d'Ayria et al. 250/578

FOREIGN PATENT DOCUMENTS

2171241 9/1973 France .

2133709 12/1973 France .

2243573 4/1975 France .

OTHER PUBLICATIONS

Applied Physics Letters, vol. 29, No. 9, Nov. 1, 1976, New York (US); J. P. Huignard et al., "High sensitivity read-write volume halographic storage in $Bi_{12}SiO_{20}$ and $Bi_{12}GeO_{20}$ crystals", pp. 591/593.

Primary Examiner—Robert L. Griffin

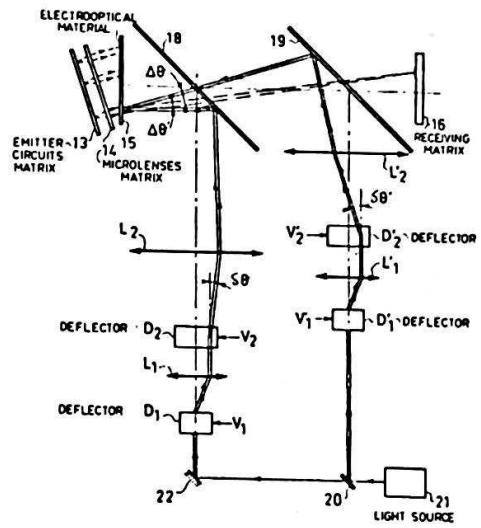
Assistant Examiner—Edward L. Coles

Attorney, Agent, or Firm—Oblon, Fisher, Spivak, McClelland & Maier

[57] **ABSTRACT**

A Switch is disclosed which makes it possible to optically connect at least one of the circuits of a group of input circuits to at least one circuit of a group of output circuits. A photosensitive medium is illuminated by parallel beams from a matrix of input circuits which beams are then defracted on layers written in the medium and then reach one of the circuits of the matrix of photoreceiver circuits. The layers are written by interference of two beams whose wavelengths differ from that of input beams with the wavelength of the input beams being out of the spectral sensitivity range of the photosensitive medium.

11 Claims, 8 Drawing Figures



United States Patent [19]

Herskowitz

[11] **4,366,565**

[45] **Dec. 28, 1982**

[54] **LOCAL AREA NETWORK OPTICAL FIBER DATA COMMUNICATION**

[76] Inventor: **Gerald J. Herskowitz, 7 Clover St., Tenafly, N.J 07670**

[21] Appl. No.: **173,654**

[22] Filed: **Jul. 29, 1980**

[51] Int. Cl.³ **H04J 15/00; H04B 9/00**

[52] U.S. Cl. **370/1; 455/612; 350/96.15; 350/96.16**

[58] Field of Search 370/1, 2, 3, 86, 69, 370/71; 455/612; 350/96.14, 96.15, 96.16, 96.18

[56] **References Cited**

U.S. PATENT DOCUMENTS

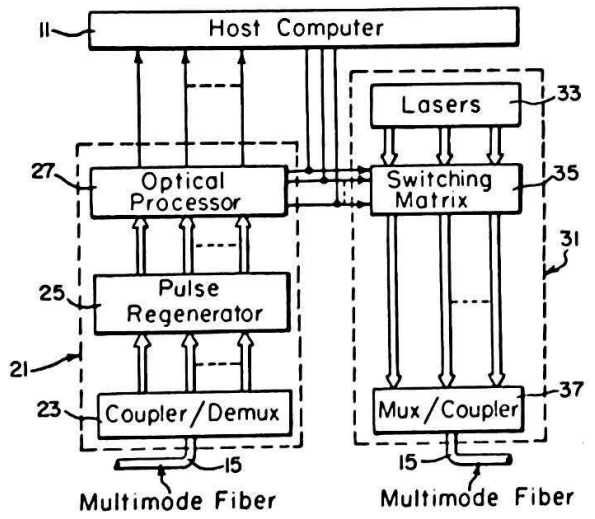
3,157,726	11/1964	Hicks et al.	455/612
3,633,034	1/1972	Uchida	370/3
3,761,716	9/1973	Kapron et al.	370/2
3,874,780	4/1975	Love	350/96.16
3,919,484	11/1975	Maxemchuk	370/86
4,262,171	4/1981	Schneider et al.	370/69

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Pennie & Edmonds

[57] **ABSTRACT**

A method and apparatus are disclosed for high speed multiaccess data communication using guided wave components and angular division multiplexing for parallel optical signal transmission over a multimode optical fiber. A receiver at each station in the network comprises an optical coupler/demultiplexer, a pulse regenerator, an optical processor and detectors. The transmitter at each station comprises an array of lasers, a switching matrix for controlling emissions into the optical fiber and a multiplexer/coupler for coupling the laser emissions to the multimode optical fiber. The optical processor is directly coupled to the switching matrix. Preferably, the multiplexer/coupler comprises a graded-index planar lens, one major surface of which abuts the optical fiber and the other major surface of which is contacted by a plurality of single mode waveguides from the different lasers of the transmitter. As a result, the single mode signals introduced into the lens at different radial distances are coupled to different modal groups propagating in the optical fiber. The coupler/demultiplexer preferably comprises a graded-index lens and an array of concentric half-ring lasers. Annular cones of radiation propagating in the optical fiber are focused to an array of concentric rings near the half-ring lasers where they are converted into linear beams propagating in single mode guided wave structures.

18 Claims, 9 Drawing Figures



United States Patent [19]

Edelman

[11] **4,334,321**

[45] **Jun. 8, 1982**

[54] **OPTO-ACOUSTIC TRANSDUCER AND TELEPHONE RECEIVER**

[76] Inventor: **Seymour Edelman, 9115 Glenridge Rd., Silver Spring, Md. 20910**

[21] Appl. No.: **226,447**

[22] Filed: **Jan. 19, 1981**

[51] Int. Cl.³ **H04B 9/00**

[52] U.S. Cl. ..... **455/614; 455/612; 455/619; 350/96.29; 179/110 R**

[58] Field of Search ..... 455/614, 612, 619; 350/96.1, 96.13, 96.29, 179/110 R, 113, 121 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

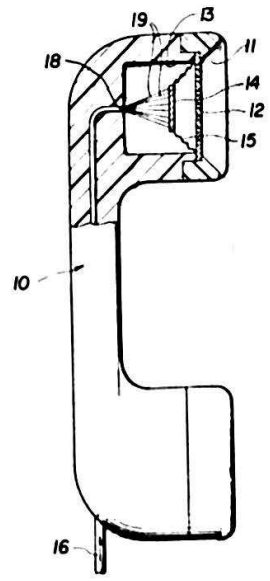
254,642	3/1882	Hale	179/110 R
345,084	7/1886	Spaulding	179/110 R
3,175,088	3/1965	Herriott	455/614
3,314,306	4/1967	Alabaster et al.	74/106 R
3,466,446	9/1969	Fassett	455/614
4,002,897	1/1977	Kleinman et al.	455/619
4,310,731	1/1982	Carlsen	179/110 R

Primary Examiner—Robert L. Griffin
Assistant Examiner—Edward L. Coles, Sr.
Attorney, Agent, or Firm—Brady, O'Boyle & Gates

[57] **ABSTRACT**

An optical fiber element of low density, low heat capacity, a large coefficient of thermal expansion, and a large Young's modulus varies in light transmissivity gradually between its ends from high transmissivity to opacity, whereby power modulated light transmitted through the fiber element is absorbed to cause a change in temperature of the fiber element and a resultant thermal expansion and contraction thereof. As a transducer in a telephone receiver, a light absorbing fiber element or group of such elements is coupled between the optical fiber waveguide in the receiver and a resiliently mounted acoustical diaphragm which is caused to respond over the audible range.

14 Claims, 5 Drawing Figures



2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

ACTIVITY SUMMARY

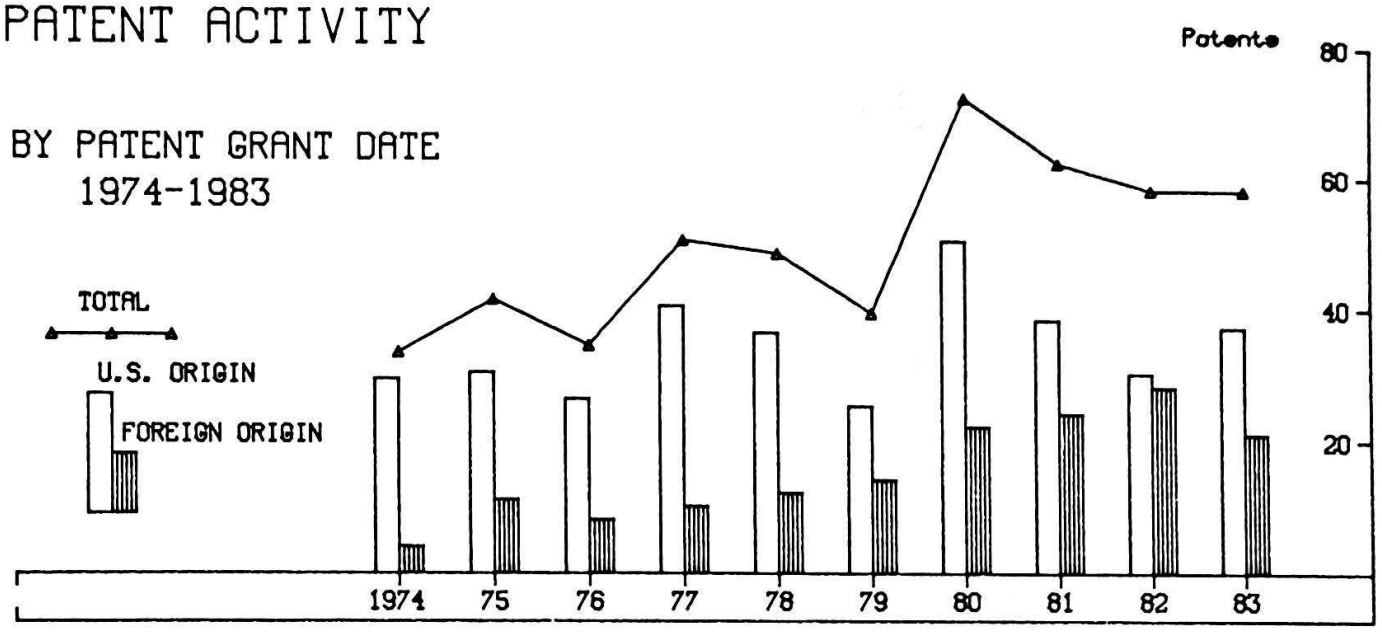
ACTIVITY INDICES (1981 - 1983)

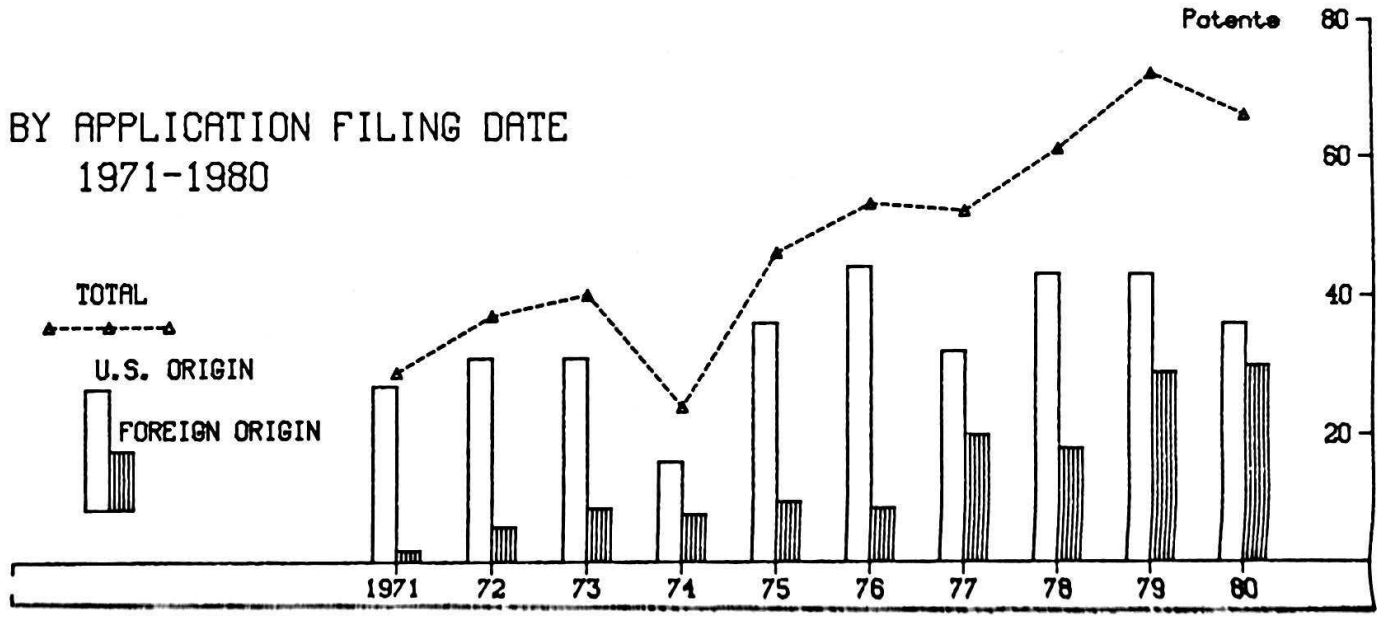
3-YEAR/10-YEAR SHARE	36.0%
FOREIGN SHARE	41.0%
CORPORATE OWNED	80.3%
GOVERNMENT OWNED	7.3%
U.S. OWNED OF FOREIGN	5.5%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 370, Subclasses 1-4

Class 455, Subclasses 600-619





2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

ORGANIZATIONS ASSIGNED 3 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
118	BELL TELEPHONE LABORATORIES, INC.
42	UNITED STATES OF AMERICA, NAVY
27	HUGHES AIRCRAFT CO.
25	UNITED STATES OF AMERICA, ARMY
21	SIEMENS AG.
18	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
16	INTERNATIONAL BUSINESS MACHINES CORP.
15	WESTINGHOUSE ELECTRIC CORP.
13	GENERAL ELECTRIC CO.
12	RCA CORP.
12	UNITED STATES OF AMERICA, AIR FORCE
11	THOMSON-CSF
9	GTE LABORATORIES INC.
9	INTERNATIONAL STANDARD ELECTRIC CORP.
9	KOKUSAI DENSHIN DENWA K.K.
9	NIPPON ELECTRIC CO., LTD.
9	UNITED STATES OF AMERICA, NASA
8	SANDERS ASSOCIATES INC.
8	SPERRY CORP.
8	ZENITH RADIO CORP.
7	SINGER CO.
7	TEXAS INSTRUMENTS, INC.
6	FORD AEROSPACE & COMMUNICATIONS CORP.
6	GTE SYLVANIA INC.
6	MINNESOTA MINING AND MANUFACTURING CO.
6	ROCKWELL INTERNATIONAL CORP.
6	UNITED TECHNOLOGIES CORP.
5	HARRIS CORP.
5	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
5	UNITED STATES OF AMERICA, DEPT. OF ENERGY
4	AMERICAN OPTICAL CORP.
4	FUJITSU LTD.
4	GENERAL DYNAMICS CORP., POMONA DIV.
4	HITACHI, LTD.
4	LIGNES TELEGRAPHIQUES ET TELEPHONIQUES STYLED L.T.T.
4	MASSACHUSETTS INSTITUTE OF TECHNOLOGY
4	NATIONAL RESEARCH DEVELOPMENT CORP.
4	NCR CORP.
4	SAAB-SCANIA AB
4	UNITED STATES OF AMERICA, ATOMIC ENERGY COMMISSION
3	BOEING CO.
3	BURROUGHS CORP.
3	CORNING GLASS WORKS
3	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
3	ELLIOTT BROTHERS LTD.
3	HONEYWELL INC.
3	ITEK CORP.
3	LICENTIA PATENT-VERWALTUNGS-GMBH
3	LOCKHEED CORP.
3	NORTHERN TELECOM LTD.
3	NORTHROP CORP.
3	XEROX CORP.

2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	308	58	61	53	35	33	41	34	50	48	39	72	62	58	58	1010
U.S. ORIGIN	285	48	51	42	32	29	30	26	40	36	25	50	38	30	37	799
FOREIGN ORIGIN	23	10	10	11	3	4	11	8	10	12	14	22	24	28	21	211
JAPAN	4	3	3	3			7	1	1	4	4	3	5	8	6	52
WEST GERMANY	7	3	3	1	1	3	1	1	3	3	2	5	5	6	7	51
FRANCE	3	2	2	2	2	1	2	2	1		4		5	7	5	38
UNITED KINGDOM	5	1		3			1	2	1	1	3	7	2	4	2	32
CANADA									1	2		1	3	2		9
SWITZERLAND		1	1	1					2	1		1	1		1	9
SWEDEN				1					1	1		3	1	1		8
ITALY	2											2	2			6
NETHERLANDS	2							1								3
FINLAND			1													1
AUSTRIA								1								1
U.S.S.R.											1					1
U.S. ORIGIN	285	48	51	42	32	29	30	26	40	36	25	50	38	30	37	799
U.S. CORP. OWNED	231	42	36	32	26	23	20	12	23	22	14	38	27	21	27	594
U.S. GOVT. OWNED	14	6	12	4	3	4	6	12	12	11	8	6	2	4	6	110
U.S. INDIV. OWNED	38		3	6	3	2	4	2	5	3	3	6	9	5	4	93
FOREIGN OWNED	2															2
FOREIGN ORIGIN	23	10	10	11	3	4	11	8	10	12	14	22	24	28	21	211
U.S. OWNED	2	1	1	1			1				3	5	2	1	1	18
FOREIGN OWNED	21	9	9	10	3	4	10	8	10	12	11	17	22	27	20	193
FOREIGN CORP.	18	8	8	9	3	2	10	8	8	10	8	14	20	25	19	170
FOREIGN GOVT.						1				1		1		1		4
FOREIGN INDIV.	3	1	1	1		1			2	1	3	2	2	1	1	19

2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979,	1980	1981	1982	1983	TOTAL
TOTAL	321	37	29	37	40	24	46	53	52	61	72	66	39	4		881
U.S. ORIGIN	281	33	27	31	31	16	36	44	32	43	43	36	24	3		680
FOREIGN ORIGIN	40	4	2	6	9	8	10	9	20	18	29	30	15	1		201
JAPAN	13			1	5	2	1	3	5	1	7	8	5	1		52
WEST GERMANY	12	1	1	3	2		4	4	1	4	5	10	3			50
FRANCE	6	2	1	2	1	2	1		5	2	3	8	4			37
UNITED KINGDOM	4	1			1	2	1	1	3	6	4	3	2			28
CANADA								1	3	2	2	1				9
SWITZERLAND	3					1	1		1	1	1		1			9
SWEDEN	1						1		1		5					8
ITALY										2	2					4
NETHERLANDS						1										1
FINLAND	1															1
AUSTRIA							1									1
U.S.S.R.									1							1
U.S. ORIGIN	281	33	27	31	31	16	36	44	32	43	43	36	24	3		680
U.S. CORP. OWNED	227	21	26	26	20	7	26	24	20	28	34	25	17	2		503
U.S. GOVT. OWNED	29	9	1	2	5	8	8	13	9	9	3	6	3			105
U.S. INDIV. OWNED	23	3		3	6	1	2	7	3	6	6	5	4	1		70
FOREIGN OWNED	2															2
FOREIGN ORIGIN	40	4	2	6	9	8	10	9	20	18	29	30	15	1		201
U.S. OWNED	2	1				1			3	5	2	1	1			16
FOREIGN OWNED	38	3	2	6	9	7	10	9	17	13	27	29	14	1		185
FOREIGN CORP.	35	2	2	4	9	7	7	7	14	11	25	27	13	1		164
FOREIGN GOVT.				1					1	1			1			4
FOREIGN INDIV.	3	1		1			3	2	2	1	2	2				17

2.1 LIGHT WAVE COMMUNICATIONS: LIGHT WAVE AND MULTIPLEXED LIGHT WAVE COMMUNICATIONS PER SE

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	462
TOTAL REFERENCES CITED	2941
U.S. Patent References Cited	2422
Foreign Patent References Cited	177
Other References Cited	342

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	1659
Japan	146
West Germany	112
France	97
United Kingdom	88

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,953,727, Thomson-CSF	12
4,089,584, Northrop Corp.	11
4,070,572, General Electric Co.	11
3,928,760, Matsushita Electric Industrial Co., Ltd.	11
3,717,769, Bell Telephone Laboratories, Inc.	11

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	232
United States of America, Navy	110
General Electric Co.	62
International Business Machines Corp.	53
International Telephone & Telegraph Corp.	50

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

DEFINITION

This profile includes different forms of optical fibers, waveguides or rods, and optical coupling and connecting devices. The optical coupling devices deliver light waves between optical structures and include lenses and prisms. The connecting devices join optical fibers or other optical elements. The particular compositions of the fibers, such as the type of cores used, are also included.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 2.2 are:

U.S. Patent 4,274,706. This patent describes a device which combines light beams of different wavelengths onto a single fiber or permits separate detectors to receive the beams. This invention is designed to be compact, inexpensive, and easily made.

U.S. Patent 4,317,614. This patent discloses a fiber optic data bus which transmits signals between master and slave terminals. The inventor claims that the system significantly reduces electronic hardware.

U.S. Patent 4,423,922. This patent discloses a directional coupler for optical communications systems. It provides a coupler which is easily manufactured, compact and which efficiently couples optical beams between a terminal and network.

U.S. Patent 4,329,017. This patent describes a module for coupling light from or to fibers. It also performs monitoring, splitting and switching functions. The monitoring function is desirable because it allows verification of module operation and determination of the fiber's integrity.

United States Patent [19]

Tangonan

[11] **4,274,706**

[45] **Jun. 23, 1981**

[54] **WAVELENGTH MULTIPLEXER/DEMULTIPLEXER FOR OPTICAL CIRCUITS**

[75] Inventor: **Gregory L. Tangonan, Oxnard, Calif.**

[73] Assignee: **Hughes Aircraft Company, Culver City, Calif.**

[21] Appl. No.: **71,323**

[22] Filed: **Aug. 30, 1979**

[51] Int. Cl.³ G02B 5/14

[52] U.S. Cl. 350/96.19; 350/96.16; 370/1

[58] Field of Search ..... 350/96.19, 96.15, 96.16, 350/162 R; 250/227; 370/1

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,111,524	9/1978	Tomlinson	350/96.19
4,143,941	3/1979	Soref	350/96.16
4,153,330	5/1979	Tomlinson	350/96.19
4,182,544	1/1980	McMahon	350/96.16

Primary Examiner—Stewart J. Levy

Attorney, Agent, or Firm—Gerald L. Cline; Allen A. Dicke, Jr.; W. H. MacAllister

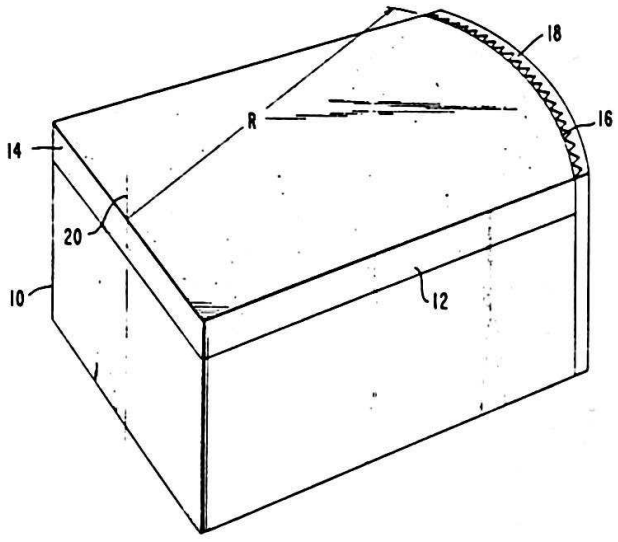
[57] **ABSTRACT**

A coupler for wavelength multiplexing or demultiplexing of multimode optical signals in optical circuits. Light introduced through an input/output surface at one end of a planar optical waveguide formed within a glass substrate propagates to a convexly curved second end of the waveguide on which is contiguously mounted a flexible, reflective diffraction grating. The light is diffracted by the diffraction grating and focussed by the curved end back onto the first end of the waveguide.

In a multiplexer (beam combiner) embodiment, a plurality of optical signal sources, each having a different wavelength component, is aligned along the first end of the waveguide so that light propagating from each of the sources travels through the waveguide to the reflective diffraction grating, is diffracted by the grating and then brought to a common focus at the first end. An optical fiber abutting the first end is positioned at the common focus to receive the combined beams.

Operating in a reverse mode, a demultiplexer (beam splitter) embodiment has an optical fiber abutting the first end surface which transmits a beam having a plurality of wavelength components through the waveguide to the reflective diffraction grating where each wavelength component in the beam is diffracted by the grating into angularly separated beams which are then brought to a focus in the plane of the first end so that each wavelength component forms a spatially separated image. A plurality of detectors or optical fibers abutting the first end surface is positioned to receive a different one of the images.

9 Claims, 4 Drawing Figures



United States Patent [19]

Palmer

[11] **4,317,614**

[45] **Mar. 2, 1982**

[54] **FIBER OPTIC BUS MANIFOLD**

[75] Inventor: **John P. Palmer, Pomona, Calif.**

[73] Assignee: **General Dynamics, Pomona Division, Pomona, Calif.**

[21] Appl. No.: **123,037**

[22] Filed: **Feb. 20, 1980**

[51] Int. Cl.³ H04B 9/00

[52] U.S. Cl. 350/96.16; 250/227; 350/96.19; 455/612

[58] Field of Search 350/96.15, 96.16, 96.17, 350/96.19, 96.20; 250/227; 370/1, 3, 4; 455/606, 607, 610, 612

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,870,398	3/1975	Love	350/96.16
3,883,217	5/1975	Love et al.	350/96.16
3,891,804	6/1975	Hachenburg	370/79
3,953,727	4/1976	d'Auria et al.	370/3
3,986,020	10/1976	Kogelnik	370/3
4,017,149	4/1977	Kao	350/96.16
4,021,097	5/1977	McMahon	350/96.15
4,027,153	5/1977	Käch	350/96.16 X
4,061,577	12/1977	Bell	370/3
4,072,399	2/1978	Love	350/96.16
4,074,127	2/1978	Mochida et al.	455/601
4,089,584	5/1978	Polczynski	350/96.16
4,135,780	1/1979	Dyott	350/96.15
4,136,929	1/1979	Suzaki	350/96.15
4,166,946	9/1979	Chown et al.	455/31

FOREIGN PATENT DOCUMENTS

52-24539	2/1977	Japan	350/96.15
54-118255	9/1979	Japan	350/96.15

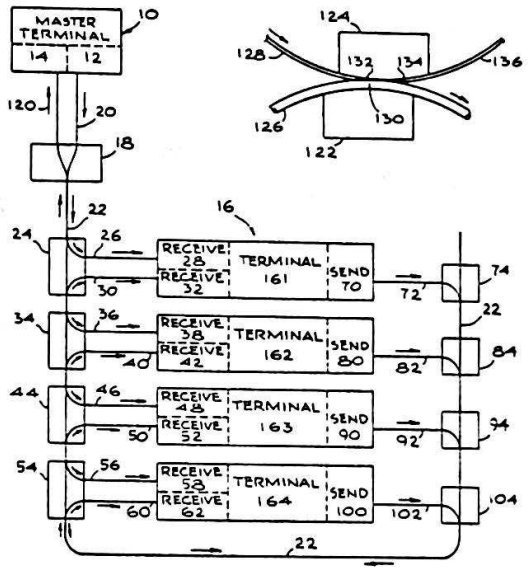
Primary Examiner—John D. Lee

Attorney, Agent, or Firm—Henry M. Bissell; Edward B. Johnson

[57] **ABSTRACT**

A bus manifold utilizing master and slave terminals wherein a single data bus transmits master terminal signals to the slave terminals continuously and simultaneously with transmission from one of the slave terminals. The system uses a single-optical-fiber transmission line coupled to the master terminal for both transmit and receive functions. The slave terminals have sending units coupled to the transmission line and a pair of receivers tap-coupled to the transmission line. Sending by the slave terminals is in the opposite direction from sending by the master terminal, and the tap coupling is effective to tap signals travelling in both directions in the line.

13 Claims, 4 Drawing Figures



United States Patent [19]
Porter

[11] 4,423,922
[45] Jan. 3, 1984

[54] DIRECTIONAL COUPLER FOR OPTICAL COMMUNICATIONS SYSTEM

[75] Inventor: David R. Porter, Seattle, Wash.

[73] Assignee: The Boeing Company, Seattle, Wash.

[21] Appl. No.: 970,730

[22] Filed: Dec. 18, 1978

[51] Int. Cl.³ G02B 5/14
[52] U.S. Cl. 350/96.15; 350/96.20; 370/4
[58] Field of Search 250/199; 350/96.15, 350/96.16, 96.17, 96.20, 96.21; 370/1, 4

[56] References Cited

U.S. PATENT DOCUMENTS

3,504,182	3/1970	Pizzurro et al.	250/199
3,870,396	3/1975	Racki et al.	350/96.16
3,883,217	5/1975	Love et al.	350/96.16
3,883,222	5/1975	Gunderson	350/96.16
3,936,141	2/1976	Milton	350/96.16
3,937,560	2/1976	Milton	350/96.16
3,977,764	8/1976	d'Auria et al.	350/96.16
4,021,099	5/1977	Kawasaki et al.	350/96.21
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4,169,656	10/1979	Hodge	350/96.15

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2721347	11/1978	Fed. Rep. of Germany	350/96.20

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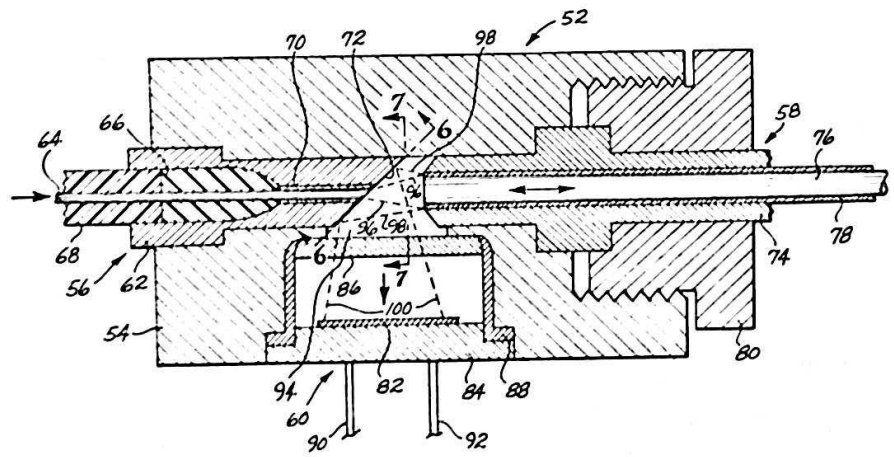
Cooper, "Coupler for Optical Data", *IBM Tech. Discl. Bulletin*, vol. 16, No. 5, Oct. 1973, pp. 1470–1471
"Simple Coupler Taps Fiber-Optic Cables", *Electronics*, Dec. 20, 1973, pp. 30–31.

Primary Examiner—John D. Lee
Attorney, Agent, or Firm—Lynn H. Hess; B. A. Donahue

[57] ABSTRACT

A directional coupler for an optical communications system of the type utilizing non-collimated optical beams transmitted by waveguides. The coupler includes an input waveguide, a network waveguide, and a detector port, and has a beam-directing surface positioned between the input waveguide and the network waveguide. The beam-directing surface defines an opening aligned with and adjacent to the input waveguide, and a beam conducting medium fills the space between the two waveguides. Input optical beams are transmitted from the input waveguide through the opening to the network waveguide, and output optical beams are transmitted from the network waveguide to the beam-directing surface. The core area of the network waveguide is large relative to the opening, and the output optical beam expands as it travels through the conducting medium to the directing surface. The portion of the output beam not entering the opening is directed to the detector port, and the area of this portion is large relative to the area of the opening so that power loss is minimal.

19 Claims, 7 Drawing Figures



United States Patent [19]
Kapany et al.

[11] 4,329,017
[45] May 11, 1982

[54] FIBER OPTICS COMMUNICATIONS MODULES

[75] Inventors: Narinder S. Kapany, Woodside; Fred. C. Unterleitner, Palo Alto, both of Calif.

[73] Assignee: Kaptron, Inc., Palo Alto, Calif.

[21] Appl. No.: 66,367

[22] Filed: Aug. 14, 1979

[51] Int. Cl.³ G02B 7/26
[52] U.S. Cl. 350/96.15; 250/227; 350/96.18; 350/96.19; 350/96.20
[58] Field of Search ..... 350/96.15, 96.16, 96.17, 350/96.18, 96.19, 96.20, 96.21, 172, 173, 174, 293, 296, 162 R; 370/1, 3; 250/227

[56] References Cited

U.S. PATENT DOCUMENTS

3,244,075	4/1966	Richards et al.	350/96.15
3,883,223	5/1975	Hudson	350/96.16
3,886,544	5/1975	Narodny	340/365 P
3,973,850	8/1976	Pouey	350/162 R X
4,013,342	3/1977	Narodny	350/96.20
4,079,382	3/1978	Henry	350/162 R X
4,094,578	6/1978	Di Vita et al.	350/96.15
4,102,579	7/1978	Stewart	356/201
4,111,524	9/1978	Tomlinson	350/96.19
4,143,941	3/1979	Soref	350/96.16
4,153,330	5/1979	Tomlinson	350/96.17
4,156,556	5/1979	Klein et al.	350/96.15
4,182,544	1/1980	McMahon	350/96.16
4,198,117	4/1980	Kobayashi	350/96.19
4,280,751	7/1981	Di Vita	350/96.15

FOREIGN PATENT DOCUMENTS

2415046	10/1975	Fed. Rep. of Germany	350/96.18
2655114	6/1977	Fed. Rep. of Germany	350/96.16
2703887	8/1977	Fed. Rep. of Germany	350/96.16
2299657	8/1976	France	350/96.18
1017354	1/1966	United Kingdom	350/96.18
1542194	3/1979	United Kingdom	350/96.18

OTHER PUBLICATIONS

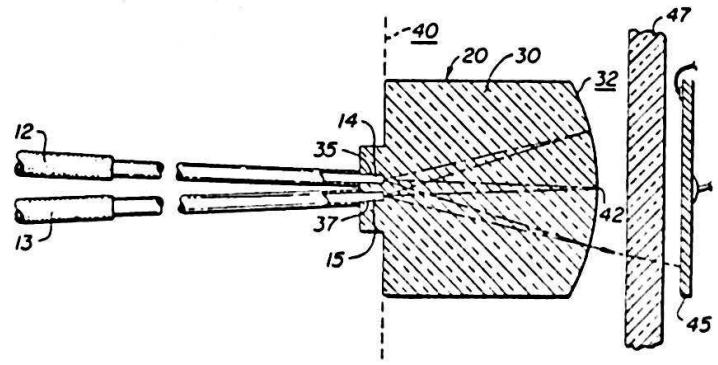
Bressani et al, "Pivoting Light Guides", *Nuclear Instruments & Methods*, vol. 136, No. 2, Jul. 1976, pp. 401–402.
Kompfner et al, "Holographic Couplers For . . . ", SRC Contract B/RG/64915, 1975 Progress Report (Part 3), Oxford Univ., Eng., Jan. 1977, pp. 79–130.
Reinhart, "Light Switch For Fiber Optics", *IBM Tech. Discl. Bull.*, vol. 19, No. 12, May 1977, pp. 4681–4682.
Lean, "Taps For Multimode Fibers", *IBM Tech. Discl. Bull.*, vol. 21, No. 4, Sep. 1978, p. 1685.

Primary Examiner—John D. Lee
Attorney, Agent, or Firm—Townsend and Townsend

[57] ABSTRACT

The present invention provides modules for interfacing optical fibers with very low light loss and with provision for monitoring of the optical signal. The modules according to the present invention are characterized by the precise tolerances required in high capacity optical communication systems and yet may be mass produced at reasonable costs. A device according to the present invention comprises a transparent imaging element having a curved reflective surface at one end and prealigned fiber insertion holes at the other end. The transparent element is characterized by an index of refraction equal to that of the fiber core, and the fibers are glued in their respective holes with index matching cement.

20 Claims, 15 Drawing Figures



2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE OR ROD

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

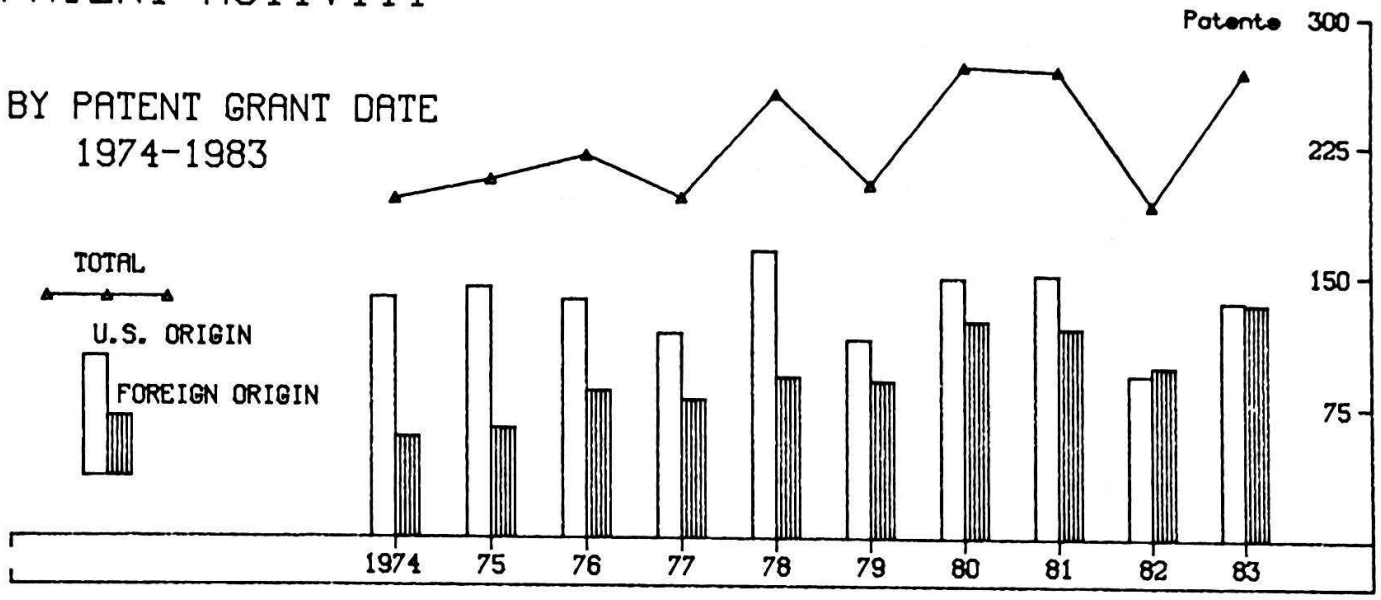
3-YEAR/10-YEAR SHARE	32.3%
FOREIGN SHARE	48.2%
CORPORATE OWNED	85.7%
GOVERNMENT OWNED	7.9%
U.S. OWNED OF FOREIGN	12.9%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

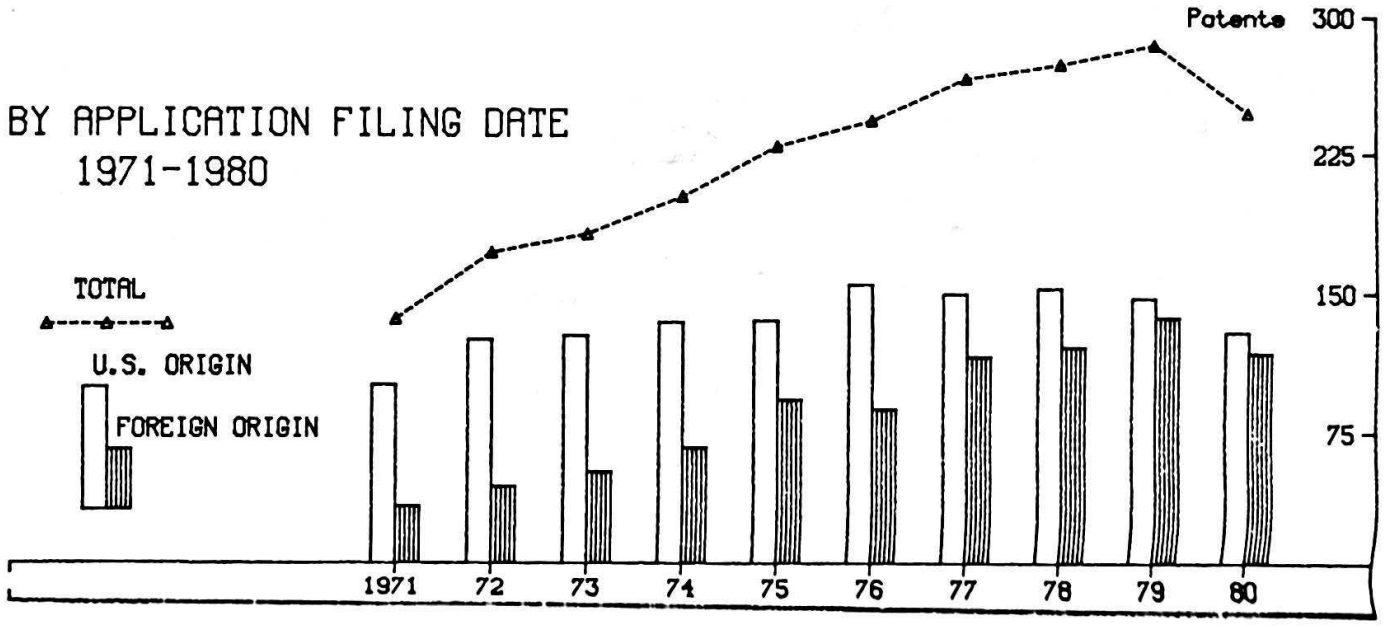
Class 350, Subclasses 96.1-96.34

PATENT ACTIVITY

BY PATENT GRANT DATE
1974-1983



BY APPLICATION FILING DATE
1971-1980



2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

ORGANIZATIONS ASSIGNED 8 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
299	BELL TELEPHONE LABORATORIES, INC.
120	SIEMENS AG.
105	UNITED STATES OF AMERICA, NAVY
93	CORNING GLASS WORKS
77	AMERICAN OPTICAL CORP.
77	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
64	THOMSON-CSF
60	INTERNATIONAL STANDARD ELECTRIC CORP.
53	INTERNATIONAL BUSINESS MACHINES CORP.
51	OLYMPUS OPTICAL CO., LTD.
44	U.S. PHILIPS CORP.
38	NIPPON SELFOC K.K.
34	NORTHERN TELECOM LTD.
33	XEROX CORP.
32	GTE LABORATORIES INC.
32	AMP INC.
31	HUGHES AIRCRAFT CO.
29	RCA CORP.
28	SPERRY CORP.
28	UNITED STATES OF AMERICA, ARMY
24	PLESSEY HANDEL UND INVESTMENTS AG.
24	POST OFFICE
22	NIPPON ELECTRIC CO., LTD.
22	WESTINGHOUSE ELECTRIC CORP.
19	BENDIX CORP.
19	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
18	UNITED STATES OF AMERICA, AIR FORCE
16	BICC LTD.
16	BUNKER RAMO CORP.
16	GENERAL MOTORS CORP.
16	HITACHI, LTD.
16	OWENS-CORNING FIBERGLAS CORP.
15	ROCKWELL INTERNATIONAL CORP.
15	SUMITOMO ELECTRIC INDUSTRIES, LTD.
15	TEXAS INSTRUMENTS, INC.
14	KOKUSAI DENSHIN DENWA K.K.
14	TOKYO SHIBAURA ELECTRIC CO., LTD.
14	TRW INC.
13	EASTMAN KODAK CO.
13	GENERAL DYNAMICS CORP., POMONA DIV.
13	UNITED TECHNOLOGIES CORP.
12	HONEYWELL INC.
12	WESTERN ELECTRIC CO. INC.
11	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
11	JENAER GLASWERK SCHOTT & GEN
11	LES CABLES DE LYON
11	NATIONAL RESEARCH DEVELOPMENT CORP.
11	UNITED STATES OF AMERICA, NASA
10	CANON K.K.
10	COMPAGNIE GENERALE D'ELECTRICITE
10	GENERAL ELECTRIC CO.
9	MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN E.V.
9	OWENS-ILLINOIS INC.
9	POLY-OPTICS, INC.
9	RANK ORGANISATION, LTD.
8	BOEING CO.
8	DEUTSCH CO.
8	HARRIS CORP.
8	ITT INDUSTRIES,INC.
8	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
8	SINGER CO.
8	THOMAS & BETTS CORP.

2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	433	124	198	145	177	190	201	215	191	251	199	268	266	189	267	3314
U.S. ORIGIN	394	99	139	106	139	134	140	133	114	161	111	146	148	92	134	2190
FOREIGN ORIGIN	39	25	59	39	38	56	61	82	77	90	88	122	118	97	133	1124
JAPAN	7	10	20	25	11	30	31	22	14	19	12	20	34	24	36	315
WEST GERMANY	12	3	13	5	8	13	9	19	21	22	22	22	23	25	31	248
UNITED KINGDOM	10	4	9	3	6	6	12	21	13	25	22	31	15	20	16	213
FRANCE	3	4	7	2	6	5	4	11	15	13	18	35	20	14	21	178
CANADA	3		1		1		2	5	3	4	5	6	11	6	8	55
NETHERLANDS	1		4	2	1		1	2	2	1	1	1	7	3	8	34
ITALY		1	1		4	1		2	1	3	4	3	5	2	3	30
SWITZERLAND		1	1	1					5	3	1	2		2	7	23
SWEDEN		1	1	1			1		1		1		2		1	9
DENMARK											1	1	1			3
ISRAEL	2															2
U.S.S.R.											1	1				2
WEST INDIES							1									1
BRAZIL					1											1
EAST GERMANY														1		1
BELGIUM			1													1
BARBADOS									1							1
NEW ZEALAND									1							1
S. AFRICA															1	1
AUSTRALIA															1	1
NICARAGUA			1													1
HUNGARY		1														1
IRELAND						1										1
NORTH KOREA	1															1
U.S. ORIGIN	394	99	139	106	139	134	140	133	114	161	111	146	148	92	134	2190
U.S. CORP. OWNED	319	88	108	89	108	105	112	99	82	129	91	124	117	71	108	1750
U.S. GOVT. OWNED	17	1	10	1	5	10	22	20	19	19	14	9	20	7	15	189
U.S. INDIV. OWNED	57	9	20	16	26	17	6	13	12	12	5	13	10	11	9	236
FOREIGN OWNED	1	1	1			2		1	1	1	1		1	3	2	15
FOREIGN ORIGIN	39	25	59	39	38	56	61	82	77	90	88	122	118	97	133	1124
U.S. OWNED	5	3	10	3	6	2	2	5	12	19	19	19	13	11	21	150
FOREIGN OWNED	34	22	49	36	32	54	59	77	65	71	69	103	105	86	112	974
FOREIGN CORP.	31	21	45	36	27	45	52	66	55	66	61	91	93	80	100	869
FOREIGN GOVT.						1	2	4	2	3	4	5	3	4	7	35
FOREIGN INDIV.	3	1	4		5	8	5	7	8	2	4	7	9	2	5	70

2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	610	132	136	171	181	201	228	242	265	273	284	247	135	22		3127
U.S. ORIGIN	482	98	101	125	127	134	135	154	149	152	147	129	71	11		2015
FOREIGN ORIGIN	128	34	35	46	54	67	93	88	116	121	137	118	64	11		1112
JAPAN	49	16	16	20	27	21	17	22	15	17	37	29	23	3		312
WEST GERMANY	27	6	8	9	13	11	27	21	23	26	33	24	16	3		247
UNITED KINGDOM	19	5	2	9	12	16	16	23	36	28	15	19	7	2		209
FRANCE	15	2	5	5		9	19	12	23	32	25	24	4	3		178
CANADA	2	1		1		4	3	5	6	9	10	8	5			54
NETHERLANDS	5	1		1	1	1	2	1	1	4	8	6	2			33
ITALY	2		4	1		3	3		5	3	5	3	1			30
SWITZERLAND	2	1				1	3	3	3	1	1	3	5			23
SWEDEN	3				1		1		1		2	1				9
DENMARK									3							3
ISRAEL	1															1
U.S.S.R.								1	2	1						4
WEST INDIES						1										1
BRAZIL		1														1
EAST GERMANY											1					1
BELGIUM	1															1
BARBADOS							1									1
NEW ZEALAND							1									1
S. AFRICA												1				1
AUSTRALIA													1			1
NICARAGUA	1															1
HUNGARY	1															1
IRELAND		1														1
NORTH KOREA																
U.S. ORIGIN	482	98	101	125	127	134	135	154	149	152	147	129	71	11		2015
U.S. CORP. OWNED	388	84	80	97	102	95	107	121	117	126	122	98	55	11		1603
U.S. GOVT. OWNED	24		4	9	12	24	16	22	20	15	13	17	8			184
U.S. INDIV. OWNED	68	13	17	17	13	14	11	10	11	11	10	13	5			213
FOREIGN OWNED	2	1		2		1	1	1	1		2	1	3			15
FOREIGN ORIGIN	128	34	35	46	54	67	93	88	116	121	137	118	64	11		1112
U.S. OWNED	16	1	4	5	1	4	12	18	23	19	17	15	12			147
FOREIGN OWNED	112	33	31	41	53	63	81	70	93	102	120	103	52	11		965
FOREIGN CORP.	105	32	27	32	46	54	72	63	84	90	108	92	46	10		861
FOREIGN GOVT.				1	2	4	2	2	5	6	3	4	5	1		35
FOREIGN INDIV.	7	1	4	8	5	5	7	5	4	6	9	7	1			69

2.2 LIGHT WAVE COMMUNICATIONS: LIGHT TRANSMITTING FIBER, WAVEGUIDE, OR ROD

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	2047
TOTAL REFERENCES CITED	14530
U.S. Patent References Cited	11059
Foreign Patent References Cited	1536
Other References Cited	1935

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	7000
Japan	778
United Kingdom	762
West Germany	576
France	435

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,455,625, Bausch & Lomb, Inc.	60
3,734,594, Bell Telephone Laboratories, Inc.	46
3,948,582, BICC Ltd.	36
3,861,781, Nippon Electric Co., Ltd.	36
3,864,018, Bell Telephone Laboratories, Inc.	34

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	1362
Corning Glass Works	569
United States of America, Navy	431
International Telephone & Telegraph Corp.	391
Siemens AG.	236

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

DEFINITION

This profile includes the structure of semiconductor lasers and arrangements that permit their operation. This type of laser is used extensively in optical communication systems. Also included are individual semiconductor devices used to detect light, or to both generate and detect light.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 2.3 are:

U.S. Patent 4,309,667. This invention is a laser device which emits radiation at different wavelengths. This laser device is useful for frequency multiplexing in optical communication systems.

U.S. Patent 4,367,483. This patent describes an optical semiconductor device wherein the light-emitting and light-receiving elements are part of an integral unit. It uses a single lens for both optical transmission and reception, thus allowing the unit to be manufactured inexpensively.

U.S. Patent 4,347,611. This patent describes a laser structure which generates a beam that may be focused into a narrow index guided filament. The inventor claims improved quality of the beam's focus.

U.S. Patent 4,380,074. This invention is a laser device and an optical amplifier. Both are mounted on an integrated circuit chip along with electronic circuits for processing information signals. The inventor believes this arrangement will lead to more efficient, compact and less costly communication systems.

United States Patent [19]

Di Forte et al.

[11] **4,309,667**

[45] **Jan. 5, 1982**

[54] **MULTIPLE LASER HAVING A DISTRIBUTED RESONATOR**

[75] Inventors: **Marie A. Di Forte; Michel Papuchon; Claude Puech, all of Paris, France**

[73] Assignee: **Thomson-CSF, Paris, France**

[21] Appl. No.: **11,926**

[22] Filed: **Feb. 13, 1979**

[30] **Foreign Application Priority Data**

Feb. 17, 1978 [FR] France 78 04529

[51] Int. Cl.³ H01S 3/19

[52] U.S. Cl. ..... 331/94.5 H; 350/96.11

[58] Field of Search ..... 331/94.5 H; 350/96.11

[56] **References Cited**

PUBLICATIONS

Aiki et al., "Frequency Multiplexing Light Source With Monolithically Integrated Distributed-Feedback Diode Lasers", *Applied Physics Letters*, vol. 29, No. 8, Oct. 15, 1976, pp. 506–508.

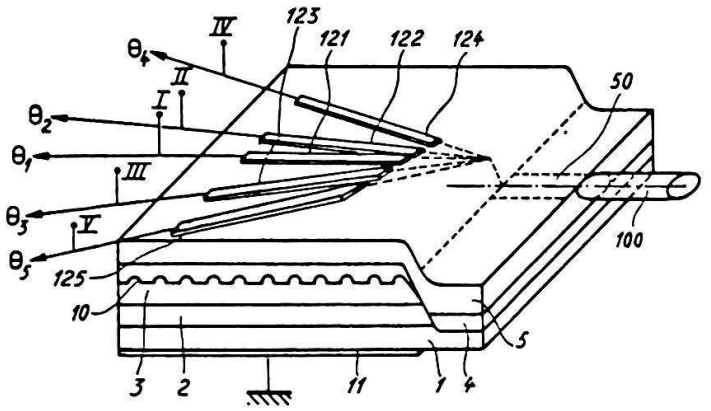
Primary Examiner—James W. Davie

Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

A semiconductor laser particularly useful for frequency multiplexing in optical telecommunications having a distributed resonator supplying from a single etched grating, two or more radiations of different wavelengths. The laser comprises a junction formed by an n-type substrate, a p-type radiation-confinement region, and a surface region, a grating being etched at the interface between the confinement region and the surface region. Useful elementary bands of the junction for the attainment of the laser effect are fixed by proton implantation in the surface region of the junction. The elementary band-type regions are convergent and form, with the perpendicular to the grooves of the grating, angles that are determined so that the spacing along the various bands has a specified value linked directly to the wavelength of the corresponding emitted radiation.

9 Claims, 4 Drawing Figures



United States Patent [19]

Takahashi et al.

[11] **4,367,483**

[45] **Jan. 4, 1983**

[54] **OPTICAL SEMICONDUCTOR DEVICE**

[75] Inventors: **Takeo Takahashi, Takasaki; Kazuhiro Kurata, Hachioji; Yuichi Ono, Tokyo, Kazuhiro Ito, Tokyo, Makoto Morioka, Tokyo; Mitsuhiro Mori, Kokubunji; Ginro Takemura, Okegawa; Makoto Sakamoto, Maebashi, Masahiro Ichiki, Tamamuramachi; Youichi Yasuda, Takasaki; Hirobumi Ouchi, Hino, all of Japan**

[73] Assignee: **Hitachi, Ltd., Tokyo, Japan**

[21] Appl. No.: **192,991**

[22] Filed: **Oct. 2, 1980**

[30] **Foreign Application Priority Data**

Oct. 3, 1979 [JP] Japan 54-126842

[51] Int. Cl.³ H01L 31/12

[52] U.S. Cl. 357/19; 357/17; 357/30; 372/50

[58] Field of Search 357/19, 17, 30; 372/50

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,216,485	8/1980	Page	357/19
4,275,404	6/1981	Cassiday	357/19

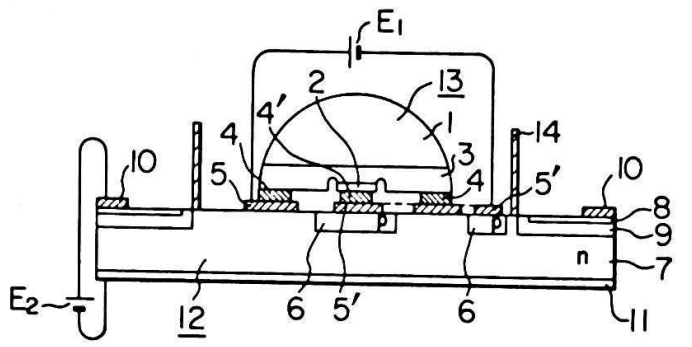
Primary Examiner—Martin H. Edlow

Attorney, Agent, or Firm—Antonelli, Terry & Wands

[57] **ABSTRACT**

An optical semiconductor device includes a light emitting element disposed on a silicon sub-mount having a light receiving element formed in a surface region. By virtue of integral arrangement of the light emitting element and the light receiving element, a single lens can be used for both optical transmission and optical reception, whereby an optical communication system can be manufactured very inexpensively. Further, transmission and reception can be carried out simultaneously.

7 Claims, 3 Drawing Figures



United States Patent [19]

Scifres et al.

[11] 4,347,611

[45] Aug. 31, 1982

[54] LARGE OPTICAL CAVITY (LOC) MESA LASER

[75] Inventors: Donald R. Scifres, Los Altos; Robert D. Burnham, Los Altos Hills; William Streifer, Palo Alto, all of Calif.

[73] Assignee: Xerox Corporation, Stamford, Conn.

[21] Appl. No.: 204,431

[22] Filed: Nov. 6, 1980

[51] Int. Cl.³ H01S 3/19

[52] U.S. Cl. 372/45; 357/17

[58] Field of Search ..... 331/94.5 H; 357/17, 357/18; 372/45, 46

[56] References Cited

U.S. PATENT DOCUMENTS

4,249,142 2/1981 Burnham et al. 372/46

4,296,387 10/1981 Sugino et al. 372/45

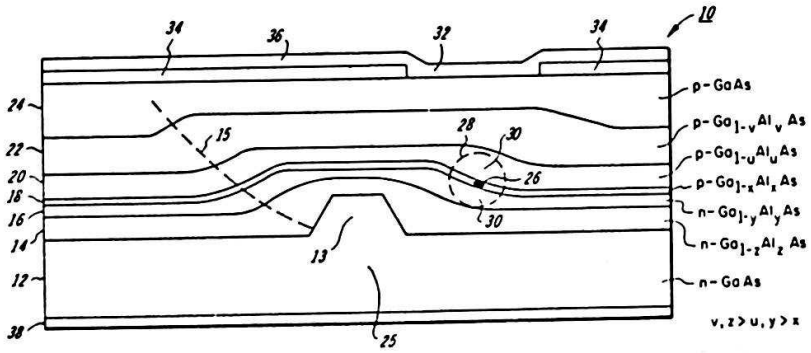
Primary Examiner—James W. Davie

Attorney, Agent, or Firm—W. Douglas Carothers, Jr.

[57] ABSTRACT

In an injection laser of the type having a mesa provided on the substrate, at least one or more radiation confinement layers is provided in the laser and with the active layer form an enlarged optical cavity (LOC) for radiation propagation to focus the beam produced into a narrow index guided filament.

6 Claims, 4 Drawing Figures



United States Patent [19]

Walsh

[11] 4,380,074

[45] Apr. 12, 1983

[54] INTEGRATED CIRCUIT LASER AND ELECTRO-OPTICAL AMPLIFIER

[76] Inventor: Peter J. Walsh, 40 St. Joseph Dr., Stirling, N.J. 07980

[21] Appl. No.: 80,526

[22] Filed: Oct. 1, 1979

[51] Int. Cl.³ H01S 3/19

[52] U.S. Cl. 372/43; 330/4.3; 357/2; 357/17

[58] Field of Search ..... 331/94.5 H, 94.5 E; 357/2, 17, 59, 61, 11, 30 R, 30 K; 372/43, 44, 50

[56] References Cited

U.S. PATENT DOCUMENTS

4,181,913 1/1980 Thornburg 357/2

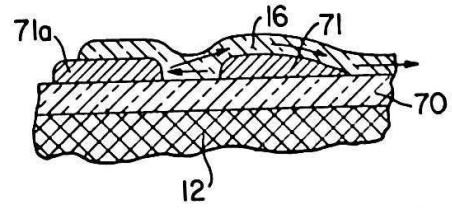
Primary Examiner—James W. Davie

Attorney, Agent, or Firm—Darby & Darby

[57] ABSTRACT

In accordance with the present invention, a laser device is formed on an integrated circuit substrate, such as a silicon chip by sandwiching a thin-film amorphous semiconductor between reflective electrodes. The upper electrode is made only partially reflective so that, when an operating potential is applied between the electrodes, a stimulated emission of light energy in the infrared range is observed and this emission occurs through the upper electrode. To form a light amplifier, the lower reflecting electrode is omitted, so that the amorphous semiconductor and the substrate form a heterojunction which has low infrared reflectivity. In operating the amplifier, a potential is applied between the upper electrode and the substrate to control amplification. Incident radiation passes through the upper electrode and into the amorphous semiconductor and substrate and, in the process, is amplified in accordance with the value of the applied potential. This permits the incident radiation to be modulated in accordance with the applied potential. In a preferred embodiment incorporating the invention, at least one laser and an amplifier are incorporated on the same substrate as electronic circuits handling information signals. The laser is a source of light radiation and the amplifier is controlled with a voltage signal from the electronics to modulate laser radiation. Radiation is coupled between the laser and the amplifier and also out of the amplifier by means of optical wave guides which are fabricated on the substrate. The modulated radiation in the wave guide from the amplifier can then be provided directly to a fiber optic "transmission line".

10 Claims, 5 Drawing Figures



2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

ACTIVITY SUMMARY

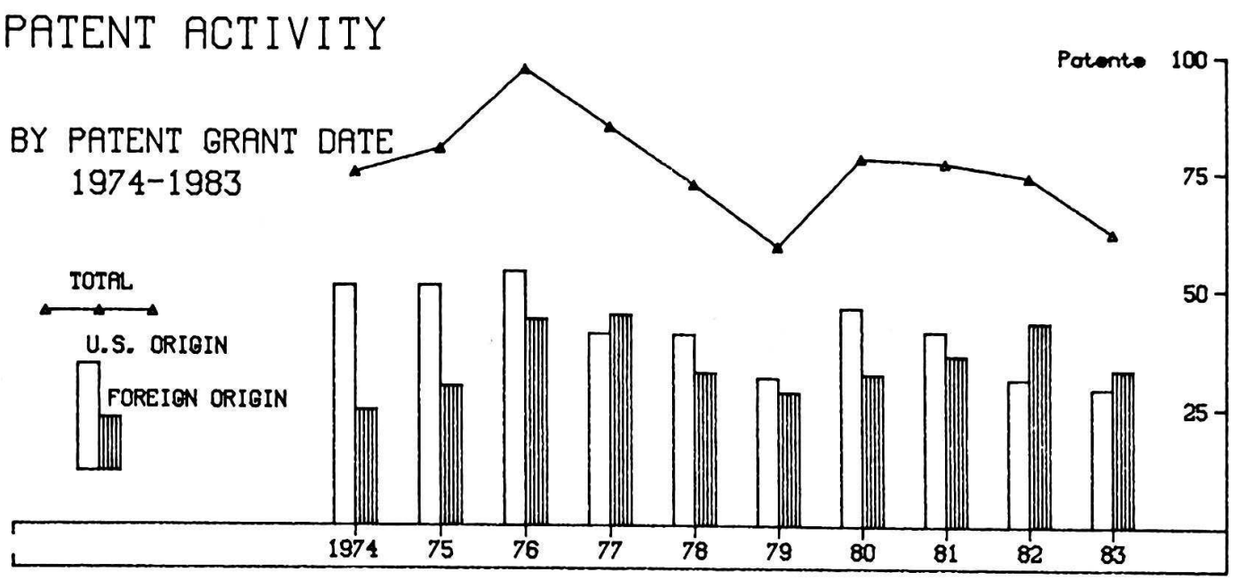
ACTIVITY INDICES (1981 - 1983)

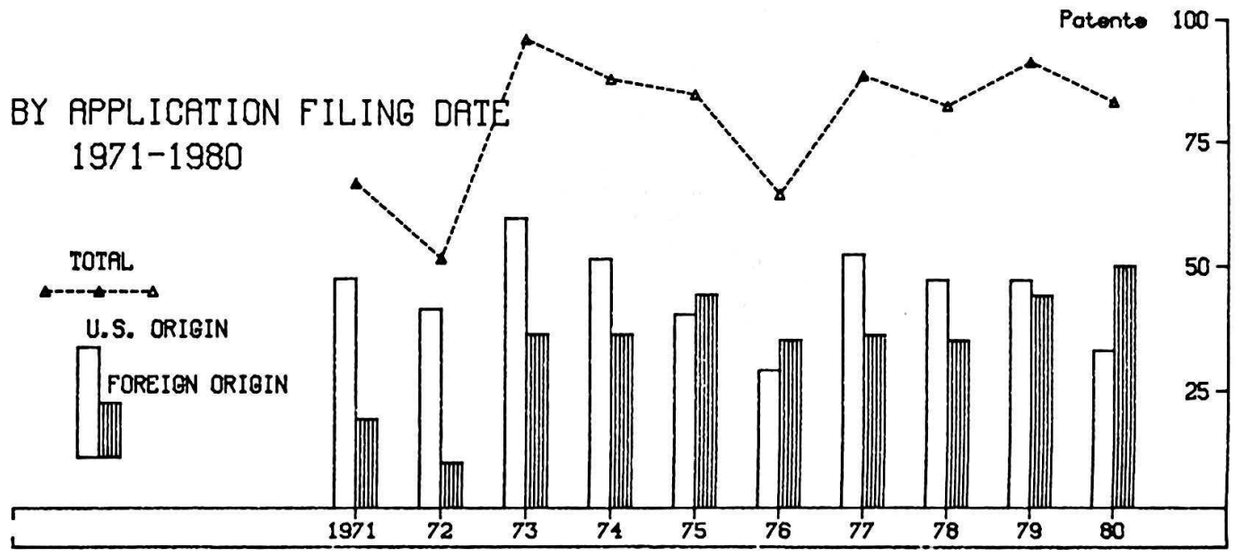
3-YEAR/10-YEAR SHARE	28.2%
FOREIGN SHARE	52.6%
CORPORATE OWNED	93.0%
GOVERNMENT OWNED	2.8%
U.S. OWNED OF FOREIGN	17.0%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 357, Subclasses 17, 19

Class 372, Subclasses 43-50, 75





2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

ORGANIZATIONS ASSIGNED 3 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
147	BELL TELEPHONE LABORATORIES, INC.
92	RCA CORP.
64	INTERNATIONAL BUSINESS MACHINES CORP.
62	HITACHI, LTD.
58	U.S. PHILIPS CORP.
46	GENERAL ELECTRIC CO.
44	XEROX CORP.
37	TEXAS INSTRUMENTS, INC.
35	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
28	NIPPON ELECTRIC CO., LTD.
23	MOTOROLA INC.
20	SIEMENS AG.
18	TOKYO SHIBAURA ELECTRIC CO., LTD.
17	INTERNATIONAL STANDARD ELECTRIC CORP.
17	MASSACHUSETTS INSTITUTE OF TECHNOLOGY
17	THOMSON-CSF
16	LICENTIA PATENT-VERWALTUNGS-GMBH
16	MONSANTO CO.
16	UNITED STATES OF AMERICA, ARMY
14	NORTHERN TELECOM LTD.
12	HEWLETT-PACKARD CO.
12	WESTINGHOUSE ELECTRIC CORP.
10	NORTON RESEARCH CORP.
9	HUGHES AIRCRAFT CO.
9	UNITED STATES OF AMERICA, NAVY
8	MITSUBISHI DENKI K.K.
7	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
7	SONY CORP.
6	HAMAMATSU TEREBI K.K.
6	MINNESOTA MINING AND MANUFACTURING CO.
6	ZENITH RADIO CORP.
5	AMP INC.
5	GTE LABORATORIES INC.
5	HARRIS CORP.
5	UNITED STATES OF AMERICA, AIR FORCE
4	AGENCE NATIONALE DE VALORISATION DE LA RECHERCHE (ANVAR)
4	CANON K.K.
4	CORNING GLASS WORKS
4	FUJITSU LTD.
4	KOKUSAI DENSHIN DENWA K.K.
4	MCDONNELL DOUGLAS CORP.
4	MITSUBISHI MONSANTO CHEMICAL CO.
4	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
4	ROCKWELL INTERNATIONAL CORP.
3	BELL AND HOWELL CO.
3	CALIFORNIA INSTITUTE OF TECHNOLOGY
3	ELECTRIC POWER RESEARCH INSTITUTE, INC.
3	EXXON RESEARCH AND ENGINEERING CO.
3	GENERAL MOTORS CORP.
3	HONEYWELL INC.
3	INSTITUT FUR ANGEWANDITE PHYSIK DER UNIVERSITAT BERN
3	ITT INDUSTRIES, INC.
3	MARCONI CO. LTD.
3	MATSUSHITA ELECTRONICS CORP.
3	NATIONAL RESEARCH CORP.
3	NATIONAL SEMICONDUCTOR CORP.
3	OMRON TATEISI ELECTRONICS CO.
3	PLESSEY HANDEL UND INVESTMENTS AG.
3	SEMICONDUCTOR RESEARCH FOUNDATION AND HITACHI, LTD.
3	SHARP K.K.
3	ZAIDAN HOJIN HANDOTAI KENKYU SHINKOKAI

2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	212	76	88	83	81	74	79	96	84	72	59	78	77	74	62	1295
U.S. ORIGIN	165	60	67	65	60	50	50	53	40	40	31	46	41	31	29	828
FOREIGN ORIGIN	47	16	21	18	21	24	29	43	44	32	28	32	36	43	33	467
JAPAN	10	5	10	11	12	15	11	17	25	15	17	14	16	32	25	235
FRANCE	2	3		1	3	5	4	7	5	4	2	8	9	2	3	58
WEST GERMANY	13	3	5	5	2	2	5	3	3	3	3	3	3	2	2	57
UNITED KINGDOM	10	1	1		3	1	7	6	7	2	2	6	3	1		50
NETHERLANDS	4	2	3						1	1	1	1	3	3	2	21
CANADA	3		1		1		1	5		2	2		2	2		19
U.S.S.R.						1		5	2	4	1					13
SWITZERLAND	2	1	1	1					1					1	1	8
SWEDEN	1															1
BURMA	1															1
AUSTRALIA										1						1
EAST GERMANY							1									1
CHINA P.REP.	1															1
ITALY		1														1
U.S. ORIGIN	165	60	67	65	60	50	50	53	40	40	31	46	41	31	29	828
U.S. CORP. OWNED	158	57	59	62	55	44	49	46	36	38	27	43	39	30	25	768
U.S. GOVT. OWNED	3		3		4	2	1	5	2	2	3	3	1		2	31
U.S. INDIV. OWNED	4	3	5	3	1	4		2	2		1		1	1	2	29
FOREIGN OWNED																
FOREIGN ORIGIN	47	16	21	18	21	24	29	43	44	32	28	32	36	43	33	467
U.S. OWNED	22	6	8		5	6	9	6	7	8	4	8	10	3	6	108
FOREIGN OWNED	25	10	13	18	16	18	20	37	37	24	24	24	26	40	27	359
FOREIGN CORP.	21	9	12	17	14	16	20	29	35	20	21	24	24	38	24	324
FOREIGN GOVT.	1				1			2			2		2	1		9
FOREIGN INDIV.	3	1	1	1	1	2		6	2	4	1			1	3	26

2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	361	63	66	51	95	87	84	64	88	82	91	83	31	2		1248
U.S. ORIGIN	279	46	47	41	59	51	40	29	52	47	47	33	18			789
FOREIGN ORIGIN	82	17	19	10	36	36	44	35	36	35	44	50	13	2		459
JAPAN	27	13	10	3	20	13	24	18	18	17	22	39	10	1		235
FRANCE	5		2	2	5	7	7	5	4	6	10	3	1			57
WEST GERMANY	21	3	1	3	5	2	1	3	6	3	3	1	1	1		54
UNITED KINGDOM	11		4	1	5	7	5	4	3	5	3	1				49
NETHERLANDS	8							1	2	2	4	3				20
CANADA	3		1			5	1	1	2	1	1	3				18
U.S.S.R.			1		1	2	5	2	2	1						14
SWITZERLAND	4	1					1				1		1			8
SWEDEN	1															1
BURMA																
AUSTRALIA								1								1
EAST GERMANY				1												1
CHINA P.REP.	1															1
ITALY	1															1
U.S. ORIGIN	279	46	47	41	59	51	40	29	52	47	47	33	18			789
U.S. CORP. OWNED	265	39	46	36	55	45	35	27	50	41	44	32	16			731
U.S. GOVT. OWNED	7	2		3	1	5	3	1	1	5	2		1			31
U.S. INDIV. OWNED	7	5	1	2	3	1	2	1	1	1	1	1	1			27
FOREIGN OWNED																
FOREIGN ORIGIN	82	17	19	10	36	36	44	35	36	35	44	50	13	2		459
U.S. OWNED	30	1	5	3	9	8	8	7	7	8	10	4	3			103
FOREIGN OWNED	52	16	14	7	27	28	36	28	29	27	34	46	10	2		356
FOREIGN CORP.	46	15	11	7	24	24	31	26	26	25	32	44	8	2		321
FOREIGN GOVT.	1		1			2			2	1	1	1				9
FOREIGN INDIV.	5	1	2		3	2	5	2	1	1	1	1	2			26

2.3 LIGHT WAVE COMMUNICATIONS: LASER LIGHT SOURCES AND DETECTORS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	681
TOTAL REFERENCES CITED	5107
U.S. Patent References Cited	4148
Foreign Patent References Cited	117
Other References Cited	842

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	2167
Japan	395
United Kingdom	162
West Germany	140
France	106

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,982,261, Varian Associates, Inc.	18
3,849,790, Licentia Patent-Verwaltungs GmbH	16
3,758,875, Bell Telephone Laboratories, Inc.	16
3,978,428, Xerox Corp.	15
3,780,358, International Standard Electric Corp.	15

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	417
RCA Corp.	234
International Business Machines Corp.	208
Hitachi, Ltd.	122
General Electric Co.	109

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)

CONTENTS

3.0 MULTIPLEX COMMUNICATIONS

INTRODUCTION

Multiplexing is the simultaneous transmission of two or more information signals in either one or both directions over the same transmission medium. This transmission is done in a manner which allows the information signals to be discretely recovered. Multiplexing promotes efficient use of communications media by more completely using the available bandwidth. The patent activity in Multiplex Communications is shown in four profiles, namely Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Binaural and Stereophonic Systems, and Other Multiplexing Techniques and Circuits. Specifically excluded are multiplexed light wave communications systems covered in Profiles 2.0-2.3 in this report.

3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)

ACTIVITY SUMMARY

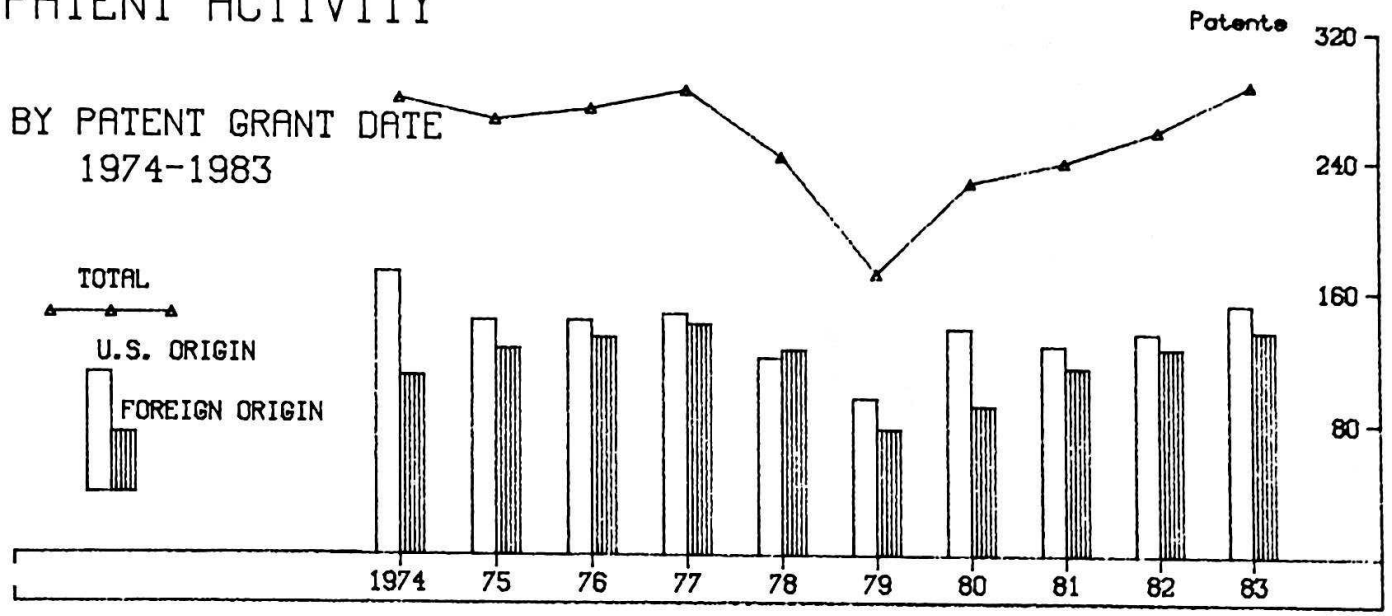
ACTIVITY INDICES (1981 - 1983)

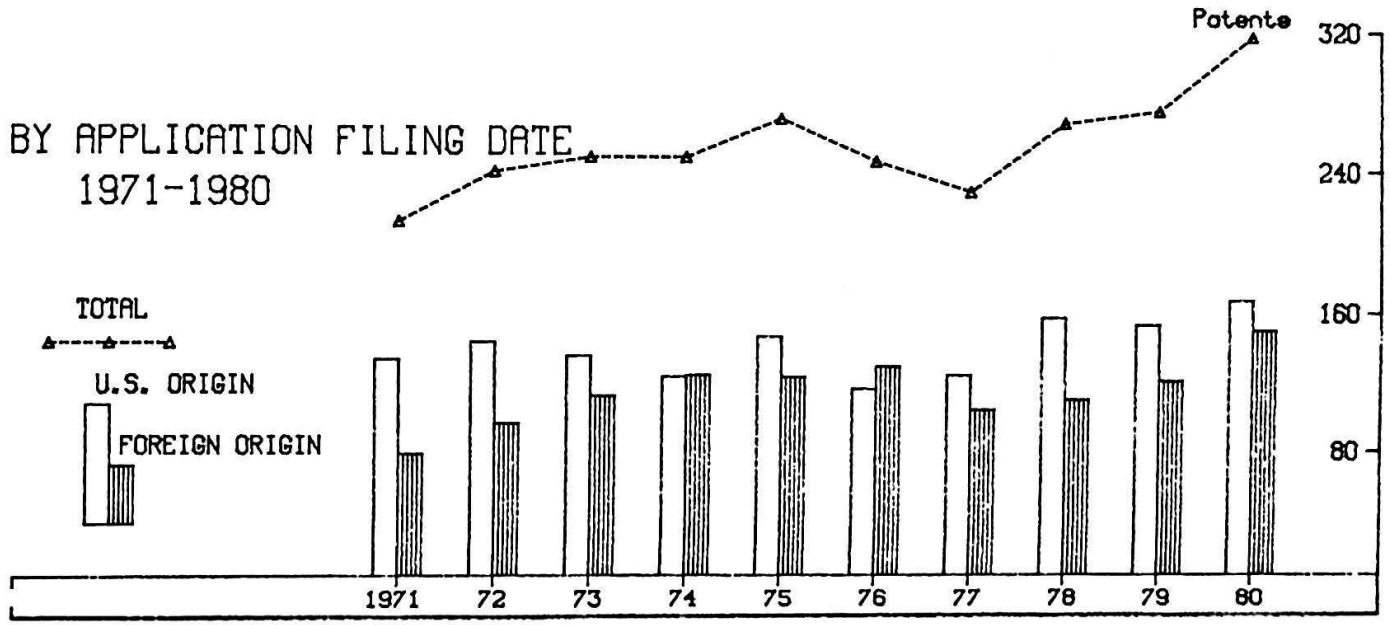
3-YEAR/10-YEAR SHARE	31.3%
FOREIGN SHARE	47.6%
CORPORATE OWNED	86.9%
GOVERNMENT OWNED	3.2%
U.S. OWNED OF FOREIGN	15.1%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 370, Subclasses 5-119 (including 120-124)

Class 381, Subclasses 1-28





3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)

ORGANIZATIONS ASSIGNED 9 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
343	BELL TELEPHONE LABORATORIES, INC.
153	SIEMENS AG.
124	INTERNATIONAL BUSINESS MACHINES CORP.
103	INTERNATIONAL STANDARD ELECTRIC CORP.
77	U.S. PHILIPS CORP.
70	MOTOROLA INC.
70	NIPPON ELECTRIC CO., LTD.
69	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
66	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
51	COMMUNICATIONS SATELLITE CORP.
44	HITACHI, LTD.
43	VICTOR CO. OF JAPAN, LTD.
42	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
42	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
40	SONY CORP.
37	RCA CORP.
37	TELEFONAKTIEBOLAGET LM ERICSSON
36	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
34	ROCKWELL INTERNATIONAL CORP.
34	UNITED STATES OF AMERICA, NAVY
30	BURROUGHS CORP.
30	SANSUI ELECTRIC CO., LTD.
29	GENERAL ELECTRIC CO.
28	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
28	THOMSON-CSF
26	PIONEER ELECTRONIC CORP.
25	CBS INC.
25	NORTHERN TELECOM LTD.
23	UNITED STATES OF AMERICA, ARMY
22	KOKUSAI DENSHIN DENWA K.K.
22	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
22	SOCIETE ANONYME DE TELECOMMUNICATIONS
22	UNITED STATES OF AMERICA, NASA
20	FUJITSU LTD.
18	STROMBERG-CARLSON CORP.
17	TOKYO SHIBAURA ELECTRIC CO., LTD.
17	TRW INC.
16	HARRIS CORP.
16	SPERRY CORP.
16	ZENITH RADIO CORP.
16	HONEYWELL INFORMATION SYSTEMS INC.
15	LICENTIA PATENT-VERWALTUNGS-GMBH
14	COLLINS RADIO CO.
14	GTE SYLVANIA INC.
14	POST OFFICE
14	TEXAS INSTRUMENTS, INC.
13	HUGHES AIRCRAFT CO.
13	WESTINGHOUSE ELECTRIC CORP.
11	GENERAL MOTORS CORP.
11	NIPPON GAKKI SEIZO K.K.
11	PLESSEY HANDEL UND INVESTMENTS AG.
10	UNITED STATES OF AMERICA, AIR FORCE
10	HONEYWELL INC.
10	RAYTHEON CO.
10	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
9	BENDIX CORP.
9	GENERAL DATACOMM INDUSTRIES, INC.
9	MARTIN-MARIETTA CORP.
9	NATIONAL RESEARCH DEVELOPMENT CORP.
9	WESTERN GEOPHYSICAL CO. OF AMERICA

3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	822	162	183	220	244	274	261	268	280	239	168	224	237	257	286	4125
U.S. ORIGIN	578	107	103	136	155	168	139	139	143	117	93	135	125	133	151	2422
FOREIGN ORIGIN	244	55	80	84	89	106	122	129	137	122	75	89	112	124	135	1703
JAPAN	57	10	21	20	28	49	46	43	50	41	29	37	30	43	45	549
WEST GERMANY	56	15	7	14	13	14	25	20	29	12	12	13	19	21	23	293
FRANCE	16	5	10	10	16	13	28	23	22	26	17	14	20	22	28	270
UNITED KINGDOM	53	8	19	9	9	4	9	11	10	10	6	6	13	5	11	183
ITALY		3	6	4	12	4	6	8	9	3	3	3	5	10	7	83
CANADA	8	5	3	7	3	5		3	6	6	3	10	6	11	7	83
NETHERLANDS	22	4	8	5	4	4	2	4	2	5	1	4	6	5	5	81
SWEDEN	13		2	1	2	4	4	7	5	9	2	1	5	2	3	60
SWITZERLAND		1	3	7		6	1	5	3	7	2		1	2	3	41
BELGIUM	12	3		1									4		1	21
AUSTRALIA				2			1	2		2			1			8
NORWAY	2	1	1					1	1			1				7
U.S.S.R.	1				1	1								1	1	5
AUSTRIA										1			2			3
ISRAEL								1						1	1	3
DENMARK	1							1						1		3
CZECHOSLOVAKIA				2												2
CHINA P.REP.						1										1
TANZANIA	1															1
LUXEMBOURG						1										1
MOROCCO				1												1
SOUTH KOREA					1											1
LIECHTENSTEIN				1												1
BRAZIL	1															1
HUNGARY	1															1
U.S. ORIGIN	578	107	103	136	155	168	139	139	143	117	93	135	125	133	151	2422
U.S. CORP. OWNED	501	90	92	120	134	145	120	119	118	95	81	97	105	111	140	2068
U.S. GOVT. OWNED	31	10	3	5	7	11	9	5	6	9	4	6	5	7	1	119
U.S. INDIV. OWNED	44	7	8	10	14	11	10	15	18	13	8	28	15	13	9	223
FOREIGN OWNED	2			1		1			1			4		2	1	12
FOREIGN ORIGIN	244	55	80	84	89	106	122	129	137	122	75	89	112	124	135	1703
U.S. OWNED	69	22	20	36	20	22	21	19	12	14	6	11	22	16	18	328
FOREIGN OWNED	175	33	60	48	69	84	101	110	125	108	69	78	90	108	117	1375
FOREIGN CORP.	157	28	53	44	65	78	92	97	120	101	63	69	70	98	95	1230
FOREIGN GOVT.	8		2				3	3	2	2		3	4	3	5	35
FOREIGN INDIV.	10	5	5	4	4	6	6	10	3	5	6	6	16	7	17	110

3.0 MULTIPLEX COMMUNICATIONS (EXCLUDING LIGHT WAVE)

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	749	183	211	239	247	247	269	245	228	267	274	317	159	9		3644
U.S. ORIGIN	471	119	133	143	135	123	146	116	124	157	153	167	74	6		2067
FOREIGN ORIGIN	278	64	78	96	112	124	123	129	104	110	121	150	85	3		1577
JAPAN	75	14	33	43	43	36	38	54	32	38	39	51	31			527
WEST GERMANY	55	14	8	14	24	17	21	17	18	17	25	23	13			266
FRANCE	24	11	10	13	19	28	24	24	22	21	20	28	17	1		262
UNITED KINGDOM	50	8	7	5	6	13	9	10	9	14	7	11	3			152
ITALY	11	3	4	11	2	8	9	6	4	2	7	8	8			83
CANADA	14	4	5	1	4	3	6	2	7	7	6	18	2	1		80
NETHERLANDS	22	2	6	2	2	4	4	2	3	7	4	5	4			67
SWEDEN	7	1		3	7	7	4	8	4	3	4	2	2			52
SWITZERLAND	7	3	2	3	2	5	4	5	4		1	2	2	1		41
BELGIUM	6	1									4	1				12
AUSTRALIA		2			1	2	1		1		1					8
NORWAY	3						2			1						6
U.S.S.R.			2								1		1			4
AUSTRIA								1			2					3
ISRAEL						1					→		2			3
DENMARK							1					1				2
CZECHOSLOVAKIA	1	1														2
CHINA P.REP.					1											1
TANZANIA	1															1
LUXEMBOURG					1											1
MOROCCO			1													1
SOUTH KOREA				1												1
LIECHTENSTEIN	1															1
BRAZIL																
HUNGARY	1															1
U.S. ORIGIN	471	119	133	143	135	123	146	116	124	157	153	167	74	6		2067
U.S. CORP. OWNED	402	104	116	125	112	105	124	100	102	119	129	143	70	5		1756
U.S. GOVT. OWNED	33	4	9	6	10	4	7	5	7	7	4	9				105
U.S. INDIV. OWNED	35	10	8	12	12	14	14	10	15	28	20	12	4	1		195
FOREIGN OWNED	1	1			1		1	1		3		3				11
FOREIGN ORIGIN	278	64	78	96	112	124	123	129	104	110	121	150	85	3		1577
U.S. OWNED	77	22	25	15	20	26	13	11	10	14	21	19	12	1		286
FOREIGN OWNED	201	42	53	81	92	98	110	118	94	96	100	131	73	2		1291
FOREIGN CORP.	178	38	50	75	88	83	102	114	85	82	84	112	62	1		1154
FOREIGN GOVT.	5	1		1		5	2	1	2	5	2	5	2			31
FOREIGN INDIV.	18	3	3	5	4	10	6	3	7	9	14	14	9	1		106

3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

DEFINITION

In FDM systems, the frequency spectrum of the transmission medium is divided into segments. Each resulting segment is used to transmit a respective information channel. Some of the FDM systems included are:

Digital analysis or synthesis
Pilot signal systems
FDM repeater circuits
Ancillary signalling systems
Duplex FDM
FDM switching.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 3.1 are:

U.S. Patent 4,402,076. This two-wire, two-way FDM system uses one frequency band for the transmitting channel and another for the receiving channel. This invention is intended to reduce noise and intermodulation distortion.

U.S. Patent 4,326,288. This system converts pulse code modulated and audio signals into FDM signals. It uses a digital conversion system which simplifies the signal multiplication factors by choosing carrier frequencies which are even multiples of the signal sampling rates.

U.S. Patent 4,361,886. This is a system for synchronizing master and slave transmitter-receiver stations which allows for compensation of a doppler shift due to relative movement of the stations.

U.S. Patent 4,385,381. The patent states that this invention of a FDM system compensates for interference and fading caused by the reception from multiple transmitters.

United States Patent [19]

Krajewski

[11] **4,402,076**

[45] **Aug. 30, 1983**

[54] **TWO WIRE F.D. MULTIPLEX SYSTEM**

[75] Inventor: **Zdzislaw A. A. Krajewski, Ajax, Canada**

[73] Assignee: **Bayly Engineering Limited, Ajax, Canada**

[21] Appl. No.: **222,904**

[22] Filed: **Jan. 5, 1981**

[30] **Foreign Application Priority Data**

May 15, 1980 [CA] Canada 352009

[51] **Int. Cl.**³ **H04L 5/14**

[52] **U.S. Cl.** **370/30; 370/120**

[58] **Field of Search** 370/69.1, 120, 30, 119

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,328,450 8/1943 Hagen 370/30

4,236,244 11/1980 Strehl 370/30

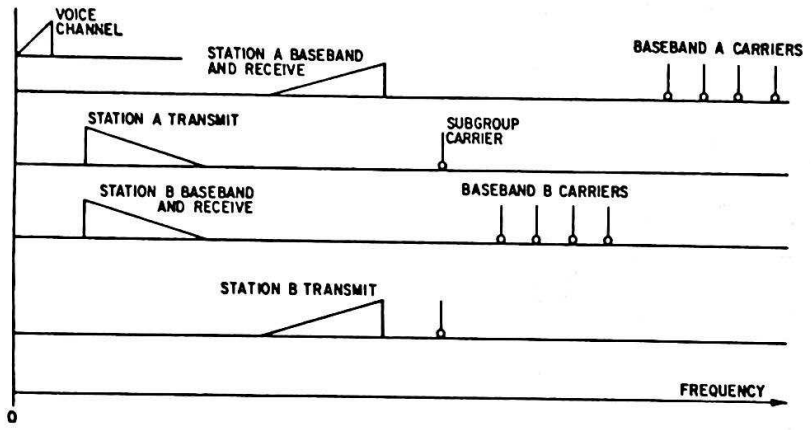
Primary Examiner—Glen R. Swann, III

Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A system comprises two kinds of multiplex stations connected by two wire lines and distinguished by two different predetermined frequency basebands each of which consists of predetermined frequencies for dividing the multiplex channels. The multiplex stations are provided with conversion means in their respective transmit paths so as to convert their own basebands to the different ones of the other multiplex stations connected and vice-versa. The system preferably provides generalized units in both kinds of multiplex stations and is simpler than a known one which uses the same basebands in all multiplex stations and converts the baseband before and after transmitting.

8 Claims, 9 Drawing Figures



United States Patent [19]

Fettweis

[11] **4,326,288**

[45] **Apr. 20, 1982**

[54] **METHOD AND APPARATUS FOR FREQUENCY DIVISION MULTIPLEX SYSTEM**

[75] Inventor: **Alfred Fettweis, Bochum, Fed. Rep. of Germany**

[73] Assignee: **Siemens Aktiengesellschaft, Berlin & Munich, Fed. Rep. of Germany**

[21] Appl. No.: **74,472**

[22] Filed: **Sep. 11, 1979**

[30] **Foreign Application Priority Data**

Sep. 15, 1978 [DE] Fed. Rep. of Germany 2840256

[51] **Int. Cl.**³ **H04J 1/05**

[52] **U.S. Cl.** **370/70; 370/69.1**

[58] **Field of Search** 370/70, 69, 50

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,882,279 5/1975 Duval et al. 370/69

3,912,870 10/1975 Roy 370/70

3,919,671 11/1975 Fettweis et al. ..... 333/70 R

3,965,300 6/1976 Markl 370/69

3,967,099 6/1976 Fettweis ..... 333/70 R

4,011,905 12/1977 Fettweis 364/724

FOREIGN PATENT DOCUMENTS

2027303 9/1975 Fed. Rep. of Germany .

2263087 2/1977 Fed. Rep. of Germany .

OTHER PUBLICATIONS

"Proceedings IEE," vol. 117, No. 8, Aug. 1977, pp. 1585-1590

"A New Method for Frequency-Division Multiplexing . . ." by Thrasher, "IBM Journal," Mar. 1965, pp. 137-139. "Techniques for the Digital Interfacing of TDM-FDM Systems," by Tomlinson et al., "Proceedings of the Institution of Electrical Engineers Electronics," vol. 123, No. 12, Dec. 1976, pp. 1285-1292.

"Proceedings IEEE Inter. Conf. on Communications," Chicago, Ill. Jun. 1977, pp. 195-199.

"IEEE Trans. on Communication Technology", vol. Com-19, No. 1, Feb. 1971, pp. 63-71.

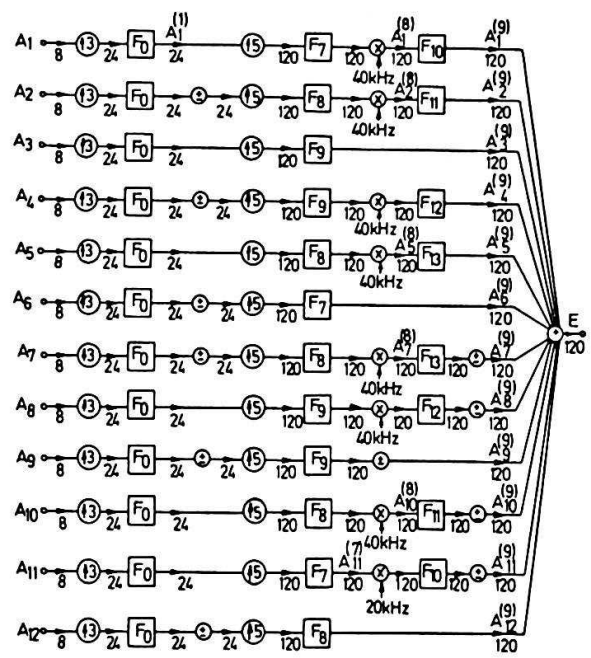
Primary Examiner—Douglas W. Olms

Attorney, Agent, or Firm—Hill, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**

A method for digital frequency conversion of audio signals or PCM signals into signals of a frequency-division multiplex system in which the original signals exist in a channel of limited band width. All channels are brought into their desired frequency ranges through simplified multiplication processes, using a basic operating rate having a frequency of six times the channel band width.

20 Claims, 26 Drawing Figures



United States Patent [19]

Gutleber

[11] **4,361,886**

[45] **Nov. 30, 1982**

[54] **SATELLITE COMMUNICATION SYSTEM**

[75] Inventor: **Frank S. Gutleber, Little Silver, N.J.**

[73] Assignee: **The United States of America as represented by the Secretary of the Army, Washington, D.C.**

[21] Appl. No.: **174,293**

[22] Filed: **Jul. 31, 1980**

[51] **Int. Cl.**[3] **H04J 1/02**

[52] **U.S. Cl.** **370/69.1**; 455/12; 370/75; 370/121

[58] **Field of Search** 370/75, 69, 6; 455/12, 455/13, 24; 370/121

[56] **References Cited**

U.S. PATENT DOCUMENTS

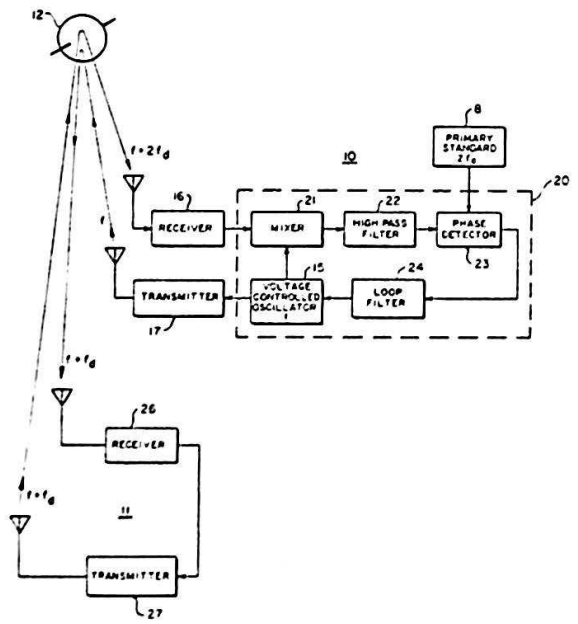
3,428,898	2/1969	Jacobsen et al.	455/12
3,683,279	8/1972	Weinberg et al.	455/12
3,824,340	7/1974	Sensney	455/12
3,835,253	9/1974	Bond	455/12
4,019,138	4/1977	Watanabe et al.	455/12
4,191,923	3/1980	Schelisch	455/12

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Nathan Edelberg; Jeremiah G. Murray; John W. Redman

[57] **ABSTRACT**

A loop-around doppler canceling loop is employed between a master ground terminal or node and a slave ground terminal or node for translating a doppler-free reference to the slave terminal by having a local voltage controlled oscillator (VCO) of frequency f at the master terminal lock to a frequency $f_o = f_d$ where f_o is frequency of the primary standard reference clock 8 at the master terminal and f_d is the two-way doppler frequency that exists during transmission between the master and slave ground terminals by way of satellite.

8 Claims, 4 Drawing Figures



United States Patent [19]

Alexis

[11] **4,385,381**

[45] **May 24, 1983**

[54] **DIGITAL RADIO TRANSMISSION SYSTEM FOR TRANSMITTING A PLURALITY OF INFORMATION SIGNALS BY A NETWORK OF TRANSMITTERS HAVING SUBSTANTIALLY THE SAME CARRIER FREQUENCIES**

[75] Inventor: **Roger P. J. Alexis, Neuilly sur Seine, France**

[73] Assignee: **U.S. Philips Corporation, New York, N.Y.**

[21] Appl. No.: **178,200**

[22] Filed: **Aug. 14, 1980**

[30] **Foreign Application Priority Data**

Aug. 29, 1979 [FR] France 79 21674

[51] **Int. Cl.**[3] **H04J 1/02; H04J 4/00**

[52] **U.S. Cl.** **370/69.1**; 370/70; 370/118

[58] **Field of Search** 370/50, 69.1, 70, 118, 370/6; 375/38

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,663,761	5/1972	Kumagai et al.	370/6
4,047,108	9/1977	Bijker et al.	375/38
4,142,155	2/1979	Adachi	375/38
4,237,551	12/1980	Narasimha	370/50

OTHER PUBLICATIONS

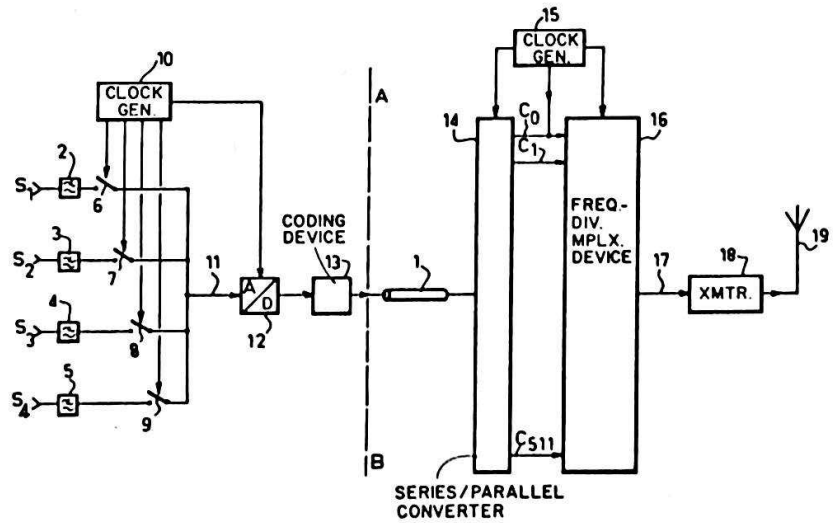
"Digital Mobile Radio Telephone System Using TD/FDMA Scheme" by Kinoshita et al., Conference: 1981 International Conf on Communications, Denver, CO. Jun. 14–18, 1981.

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Thomas A. Briody; William J. Streeter; Edward W. Goodman

[57] **ABSTRACT**

In this system in which the information signals to be transmitted are converted into the digital form, transmission is done via a frequency-division multiplexer which so transmit the bits of the information signals in parallel that the duration of the bits transmitted through the channels of the multiplexer is longer than double the difference in propagation time between two carriers obtained from the two transmitters which are nearest in the receiving zone, where the said carriers have levels which are near to one another. This solves the problem of overlap between the information signals. To control the problem of fading, three types of transmitters which have three carriers whose deviation is very small compared with the bandwith of a channel are used in the transmitter network.

5 Claims, 3 Drawing Figures



3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

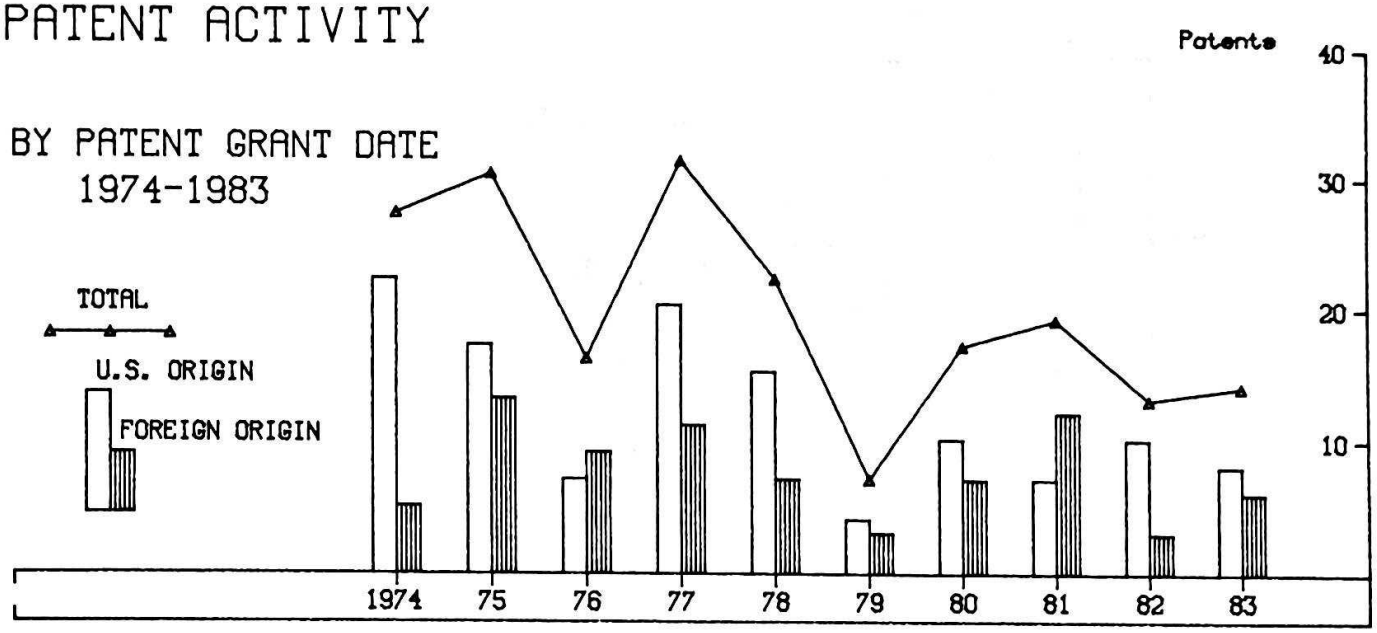
ACTIVITY SUMMARY

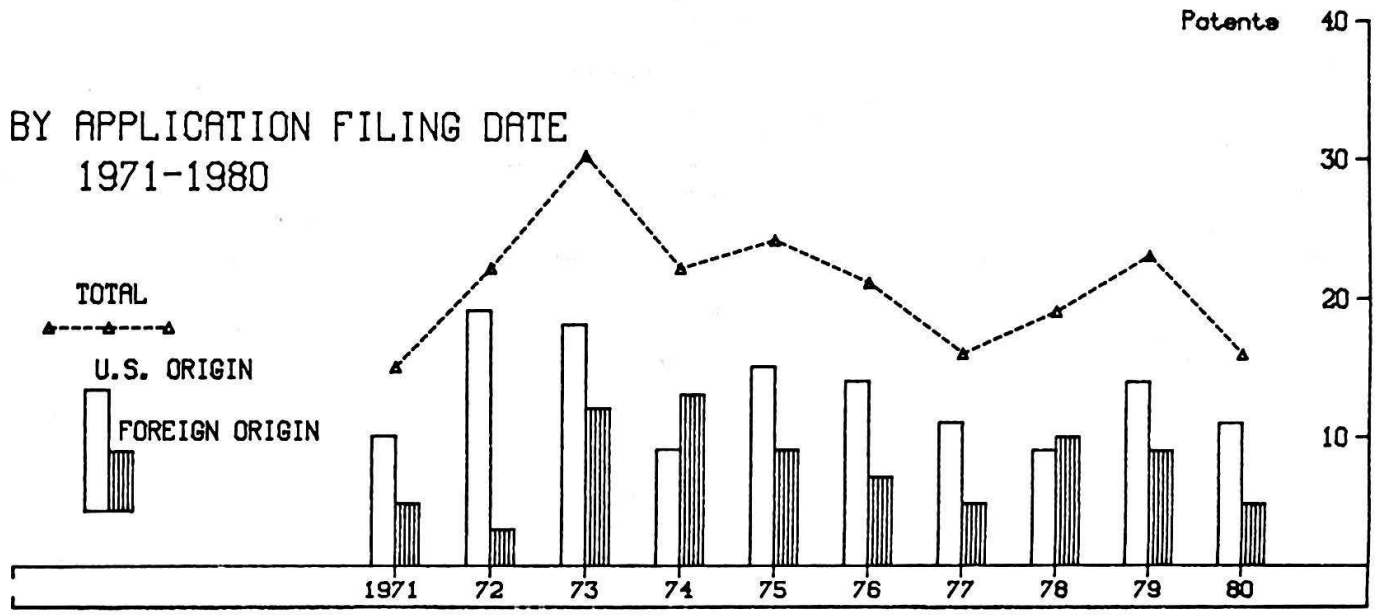
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	23.5%
FOREIGN SHARE	45.7%
CORPORATE OWNED	87.0%
GOVERNMENT OWNED	2.2%
U.S. OWNED OF FOREIGN	19.0%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 370, Subclasses 45, 57, 69.1-76 (including 120-124)





3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

ORGANIZATIONS ASSIGNED 2 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
36	BELL TELEPHONE LABORATORIES, INC.
14	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
11	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
10	SIEMENS AG.
9	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
9	NIPPON ELECTRIC CO., LTD.
9	U.S. PHILIPS CORP.
8	THOMSON-CSF
7	COMMUNICATIONS SATELLITE CORP.
7	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
6	INTERNATIONAL STANDARD ELECTRIC CORP.
6	SUPERIOR CONTINENTAL CORP.
5	INTERNATIONAL BUSINESS MACHINES CORP.
5	UNITED STATES OF AMERICA, AIR FORCE
4	GENERAL ELECTRIC CO.
4	MOTOROLA INC.
4	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
4	RCA CORP.
4	RELIANCE TELECOMMUNICATION ELECTRONICS CO.
4	ROCKWELL INTERNATIONAL CORP.
4	STROMBERG-CARLSON CORP.
4	UNITED STATES OF AMERICA, NASA
3	CARRIER TELEPHONE CORP. OF AMERICA, INC.
3	LICENTIA PATENT-VERWALTUNGS-GMBH
3	TELEFONAKTIEBOLAGET LM ERICSSON
3	TII CORP.
3	UNITED STATES OF AMERICA, ARMY
2	ANACONDA CO.
2	BRITISH TELECOMMUNICATIONS RESEARCH LTD.
2	CSELT-CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
2	DIGITAL DATA INC.
2	HAZELTINE RESEARCH INC.
2	I. I. COMMUNICATIONS, INC.
2	KOKUSAI DENSHIN DENWA K.K.
2	LITTON SYSTEMS INC.
2	LOCKHEED CORP.
2	SEISMOGRAPH SERVICE CORP.
2	SPERRY CORP.
2	TELEPLEX, INC.

3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	72	27	22	19	18	27	30	16	31	22	7	17	19	13	14	354
U.S. ORIGIN	48	24	14	14	14	22	17	7	20	15	4	10	7	10	8	234
FOREIGN ORIGIN	24	3	8	5	4	5	13	9	11	7	3	7	12	3	6	120
FRANCE	2		3		1	1	8	3	7	2	1		4	1	3	36
JAPAN	7	1			2	2	1	1	1	1	1	4	3			24
WEST GERMANY	5	1		1	1	1	4	2	1	1	1	2		2		22
UNITED KINGDOM	9		3										1		1	14
CANADA	1			1		1			1			1	1		1	7
ITALY			1	1				1	1						1	5
NETHERLANDS				1				2		1			2			4
SWEDEN										1			1			4
SWITZERLAND				1						1						2
NORWAY		1	1													2
U.S. ORIGIN	48	24	14	14	14	22	17	7	20	15	4	10	7	10	8	234
U.S. CORP. OWNED	37	19	14	11	13	16	15	7	20	11	3	7	6	9	7	195
U.S. GOVT. OWNED	5	4		1		1	2			1				1		15
U.S. INDIV. OWNED	5	1		2	1	4				3	1	3	1		1	22
FOREIGN OWNED	1					1										2
FOREIGN ORIGIN	24	3	8	5	4	5	13	9	11	7	3	7	12	3	6	120
U.S. OWNED	3		1	3			3	1	1	2		1	3		1	19
FOREIGN OWNED	21	3	7	2	4	5	10	8	10	5	3	6	9	3	5	101
FOREIGN CORP.	19	2	5	2	4	5	10	7	10	5	3	6	7	3	4	92
FOREIGN GOVT.	1		1													2
FOREIGN INDIV.	1	1	1					1					2		1	7

3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	86	15	15	22	30	22	24	21	16	19	23	16	4	1		314
U.S. ORIGIN	63	12	10	19	18	9	15	14	11	9	14	11	2			207
FOREIGN ORIGIN	23	3	5	3	12	13	9	7	5	10	9	5	2	1		107
FRANCE	3			1	7	6	6	3	1	2	2	2		1		34
JAPAN	6		2	1	2	1		2	1	3	3	1				22
WEST GERMANY	3	2	1		3	3	1		2	2	1	1				19
UNITED KINGDOM	6	1								1	1					9
CANADA	1			1			1				1	1	1			6
ITALY	2					1	1						1			5
NETHERLANDS			1						1	2						4
SWEDEN						2		1			1					4
SWITZERLAND			1					1								2
NORWAY	2															2
U.S. ORIGIN	63	12	10	19	18	9	15	14	11	9	14	11	2			207
U.S. CORP. OWNED	49	10	9	15	14	9	15	11	9	7	12	9	2			171
U.S. GOVT. OWNED	8	1		1	2				1			1				14
U.S. INDIV. OWNED	5	1	1	3	1			3	1	2	2	1				20
FOREIGN OWNED	1				1											2
FOREIGN ORIGIN	23	3	5	3	12	13	9	7	5	10	9	5	2	1		107
U.S. OWNED	3		2			5			2	3	1	1				17
FOREIGN OWNED	20	3	3	3	12	8	9	7	3	7	8	4	2	1		90
FOREIGN CORP.	18	2	3	3	12	7	9	7	3	6	7	3	2	1		83
FOREIGN GOVT.		1														1
FOREIGN INDIV.	2					1				1	1	1				6

3.1 MULTIPLEX COMMUNICATIONS: FREQUENCY DIVISION MULTIPLEXING (FDM)

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	169
TOTAL REFERENCES CITED	888
U.S. Patent References Cited	766
Foreign Patent References Cited	29
Other References Cited	93

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	457
France	52
Japan	49
West Germany	31
Netherlands	18

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,864,521, Rockwell International Corp.	9
3,809,815, Litton Systems, Inc.	9
3,605,019, International Business Machines Corp.	9
3,891,803, Telecommunications Radioelectriques et Telephoniques	6
3,676,598, Bell Telephone Laboratories, Inc.	6

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	57
GTE Automatic Electric Laboratories, Inc.	25
U.S. Philips Corp.	19
Communications Satellite Corp.	19
Superior Continental Corp.	17

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

DEFINITION

In TDM systems, access to the communications medium is divided into discrete time intervals and individual information channels are assigned different time intervals. Assignment of channels to their respective time intervals, commonly called "time slots," can be constant or variable. This profile includes such TDM systems and techniques as:

Polarity multiplexing
Time assigned speech interpolation
Bus systems
Loop systems
Address transmitted (including packet)
TDM repeaters
Pilot
Ancillary signalling
Synchronizing
Multiplexers/distributors
Combined TDM/FDM systems
Duplex TDM
TDM switching.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 3.2 are:

U.S. Patent 4,377,860. This invention sends data and voice simultaneously by reducing the sampling rate for the voice signals and using the conserved bandwidth to transmit data when needed. It is an example of the problems and possible solutions associated with the simultaneous TDM transmission of voice and data information.

U.S. Patent 4,389,720. This patent shows a TDM conference arrangement.

U.S. Patent 4,390,981. This patent demonstrates the use of a microprocessor-controlled message handling system for low speed terminals.

U.S. Patent 4,408,323. This patent shows a switching facility which can accommodate both voice and data information.

United States Patent [19]

Godbole

[11] **4,377,860**

[45] **Mar. 22, 1983**

[54] **BANDWIDTH REDUCTION METHOD AND STRUCTURE FOR COMBINING VOICE AND DATA IN A PCM CHANNEL**

[75] Inventor: **Vishwas R. Godbole, San Jose, Calif.**

[73] Assignee: **American Microsystems, Inc., Santa Clara, Calif.**

[21] Appl. No.: **222,702**

[22] Filed: **Jan. 5, 1981**

[51] **Int. Cl.**³ **H04J 3/16**

[52] **U.S. Cl.** **370/84**; 370/119; 375/25; 375/121

[58] **Field of Search** 370/84, 119; 375/25, 375/121

[56] **References Cited**

U.S. PATENT DOCUMENTS

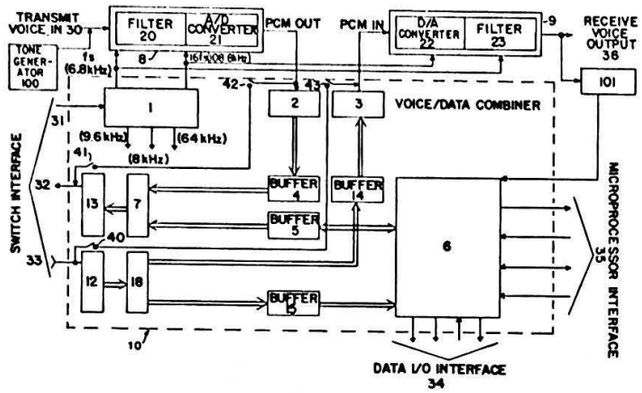
3,207,851	9/1965	Fukinuki	375/25
3,796,835	3/1974	Closs et al.	370/84
3,864,524	2/1975	Walker	370/84
3,987,251	10/1976	Texier et al.	370/84
4,143,242	3/1979	Horiki	370/84

Primary Examiner—Glen R. Swann, III
Attorney, Agent, or Firm—Alan H. MacPherson; Steven F. Caserza, Richard Franklin

[57] **ABSTRACT**

In the present invention, analog voice information is sampled at a first sampling rate, during periods when voice information is to be transmitted at a frequency which provides a digitized voice rate equal to the transmission rate capability of the transmission channel. During periods when both voice and data are to be transmitted, the analog voice information is sampled at a second sampling rate less than the first sampling rate, thus allowing the merged voice and data information to have a total digitized transmission rate equal to the transmission rate capability of the transmission channel.

11 Claims, 9 Drawing Figures



100

United States Patent [19]

Baxter et al.

[11] **4,389,720**

[45] **Jun. 21, 1983**

[54] **DISTRIBUTED DIGITAL CONFERENCING SYSTEM**

[75] Inventors: **Leslie A. Baxter**, Eatontown; **Paul R. Berkowitz**, Red Bank; **Clair A. Buzzard**, Lincroft, all of N.J.

[73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J.

[21] Appl. No.: **256,937**

[22] Filed: **Apr. 23, 1981**

[51] **Int. Cl.**³ **H04Q 11/04**

[52] **U.S. Cl.** 370/62; 370/67

[58] **Field of Search** ..... 179/18 BC, 1 CN; 370/62, 110.1, 66, 67; 364/716

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,051,358	9/1977	Schwartz	364/716
4,059,735	11/1977	Betts	179/18 BC
4,112,258	9/1978	Alles	370/110.1
4,112,490	9/1978	Pohlman et al.	364/200
4,119,807	10/1978	Nahay	179/18 BC
4,125,747	11/1978	Picquendar	370/59
4,225,956	9/1980	Betts et al.	370/62
4,228,536	10/1980	Gueldenpfennig et al.	370/66
4,229,814	10/1980	Betts	370/62
4,274,155	6/1981	Funderburk et al.	370/62

OTHER PUBLICATIONS

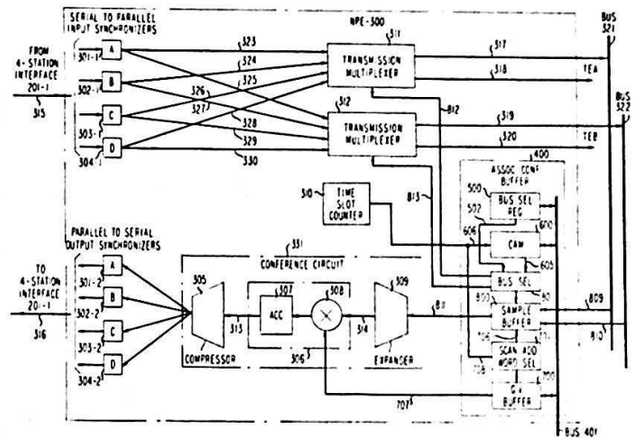
1980 Publication of INTEL Corp. entitled "Telephony and Signal Processing", Chapter 4.

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—David H. Tannenbaum

[57] **ABSTRACT**

In time division communication systems one conference technique is to have a processor combine those samples going to a particular station forming a conference having as many subcombinations as there are stations. This approach, while allowing individual station gain adjustment, suffers from its dependence upon a large number of logic operations for a given conference. A modification of this technique is disclosed which uses a distributed structure such that the individual station ports, under local memory and processor control, operate to combine selected time slot samples into a conference sum unique to the station. In this manner gain values may be assigned on an individual listener station basis while the logic processing for the conference is performed in parallel by the ports involved in the conference.

10 Claims, 12 Drawing Figures



United States Patent [19]

Wood et al.

[11] **4,390,981**

[45] **Jun. 28, 1983**

[54] **MICROPROCESSOR CONTROLLED MESSAGE HANDLING SYSTEM**

[75] Inventors: **Leonard J. Wood**, San Mateo; **Balakrishna Parasuraman**; **Edwin H. Williams**, both of Sunnyvale; **Mark G. Alexander**, Mountain View; **Richard C. Montgomery, Jr.**, Santa Clara, all of Calif.

[73] Assignee: **Syscom, Inc.**, Sunnyvale, Calif.

[21] Appl. No.: **220,375**

[22] Filed: **Dec. 29, 1980**

[51] Int. Cl.³ **H04J 3/04**

[52] U.S. Cl. **370/56**; 370/41; 370/61

[58] Field of Search ..... 370/41, 42, 56, 61, 370/85, 62, 109; 178/2 R, 2 C, 3; 179/18 ES, 27 R, 27 A, 27 C

[56] **References Cited**

U.S. PATENT DOCUMENTS

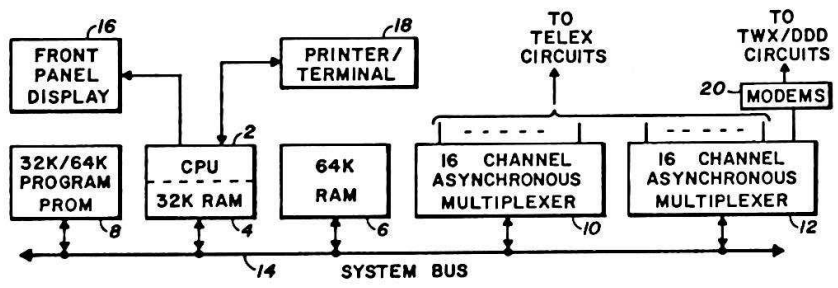
3,714,377	1/1973	Moretti	370/61
3,749,841	7/1973	Cohen et al.	370/41
3,922,497	11/1975	Artom et al.	370/61
4,232,386	11/1980	McDonald et al.	370/56
4,262,171	4/1981	Schneider et al.	370/30
4,263,670	4/1981	Sherman	375/9
4,330,847	5/1982	Kuseski	370/61

Primary Examiner—Benedict V. Safourek
Attorney, Agent, or Firm—Harry M. Weiss

[57] **ABSTRACT**

A message handling system includes a computer controlled message processor for use in network configurations to store and forward low-speed messages between long distance and international communicators. Its use is based on dial-up connections between network nodes. Each message handler unit includes a microprocessor, program and buffer storage memories, line multiplexing circuitry, modems and input/output peripheral devices. The message handler unit may comprise a 32 port system, 30 of which are used as input ports and two of which are used as high-speed output ports. A journal of all message numbers is maintained on a printer for complete message accountability.

22 Claims, 10 Drawing Figures



101

United States Patent [19]

Montgomery

[11] **4,408,323**

[45] **Oct. 4, 1983**

[54] **PROCESSOR FACILITIES FOR INTEGRATED PACKET AND VOICE SWITCHING**

[75] Inventor: **Warren A. Montgomery**, De Kalb, Ill.

[73] Assignee: **Bell Telephone Laboratories, Incorporated**, Murray Hill, N.J

[21] Appl. No.: **278,861**

[22] Filed: **Jun. 29, 1981**

[51] Int. Cl.¹ **H04Q 11/04**

[52] U.S. Cl. **370/60**; 370/58

[58] Field of Search 370/60, 58, 94, 66

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,627,951	12/1971	Batin	179/15
3,988,545	10/1976	Kuemmerle et al.	370/60
4,032,719	6/1977	Blasbalg	179/15
4,071,701	1/1978	Leijonhufvud et al.	179/15
4,112,258	9/1978	Alles	179/15
4,154,982	5/1979	Charransol et al.	179/15
4,207,435	6/1980	Okada et al.	370/68

FOREIGN PATENT DOCUMENTS

1027265	2/1978	Canada .
2451837	5/1975	Fed. Rep. of Germany .
2122740	8/1972	France .
1441452	6/1976	United Kingdom
1444804	8/1976	United Kingdom .
1521209	8/1978	United Kingdom .
1528240	10/1978	United Kingdom

OTHER PUBLICATIONS

1980 International Conference on Communications, Seattle, Wa., 8-12 Jun., 1980, by Ross et al., "An Architecture For A Flexible Integrated Voice/Data Switch", pp. 21.6.1-21.6.5.

"Pacuit Switching Combines Two Techniques in One Network" by Sanders & de Smet, Computer Design, vol. 15, No. 6, p. 83-88, Jun. 1976.

"Integrated Service Communication System" by Ito et al., NTG-Fachber (Germany), vol. 73, 1980, pp. 177-181.

"Flexible Multiplexing Technique . . . " by Miyahara et al., Transactions of the IECE of Japan, vol. E64, No. 6, Jun. 1981, pp. 390-397.

1978 International Zurich Seminar on Digital Communications, Mar. 7-9, 1978, Zurich "A Flexible Experimental Digital Switching Office", pp. A4.1-A4.4.

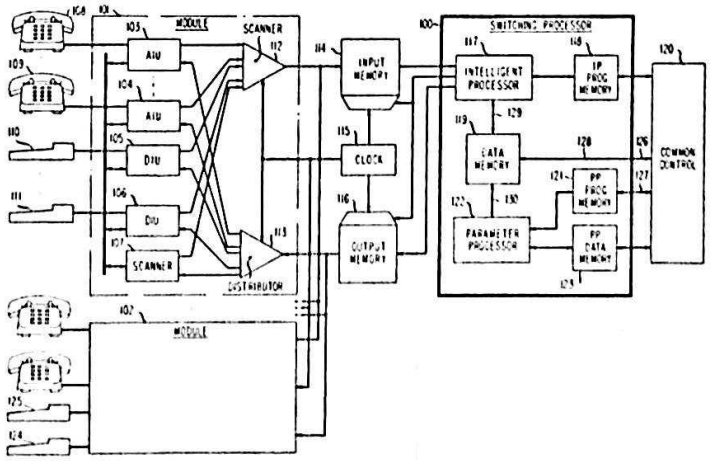
1978 International Zurich Seminar on Digital Communications, Mar. 7-9, 1978, Zurich "An Intelligent Network Processor for a Digital Central Office", pp. A5.-1-A5.6.

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—F. W. Padden

[57] **ABSTRACT**

A communication method and switching system in which voice and data signals are communicated through the system by a programmed controlled switching processor. The switching processor reads these signals from an input memory where they were transferred from telephone stations and data terminals by a scanner. The voice and data signals are transmitted to telephone stations and data terminals by the switching processor storing these signals in an output memory from which they are retransmitted by a distributor to the telephone stations and data terminals. The intelligent processor reads data signals from the input memory and assembles these signals into data packets which are temporarily stored in the data memory. Subsequently, the intelligent processor transmits these data packets by storing the data signals in the output memory. The intelligent processor is controlled by program instructions from its program memory and data stored in a data memory by a parameter processor which has associated program and data memories.

38 Claims, 19 Drawing Figures



3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

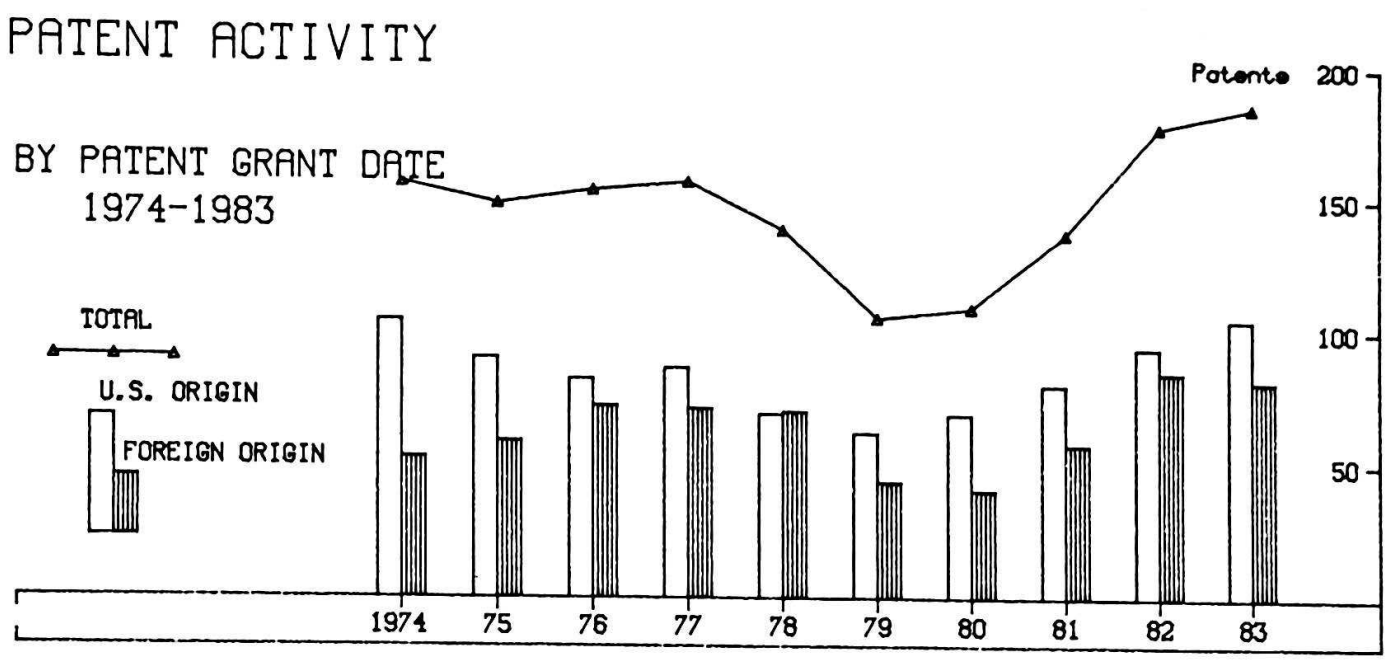
ACTIVITY SUMMARY

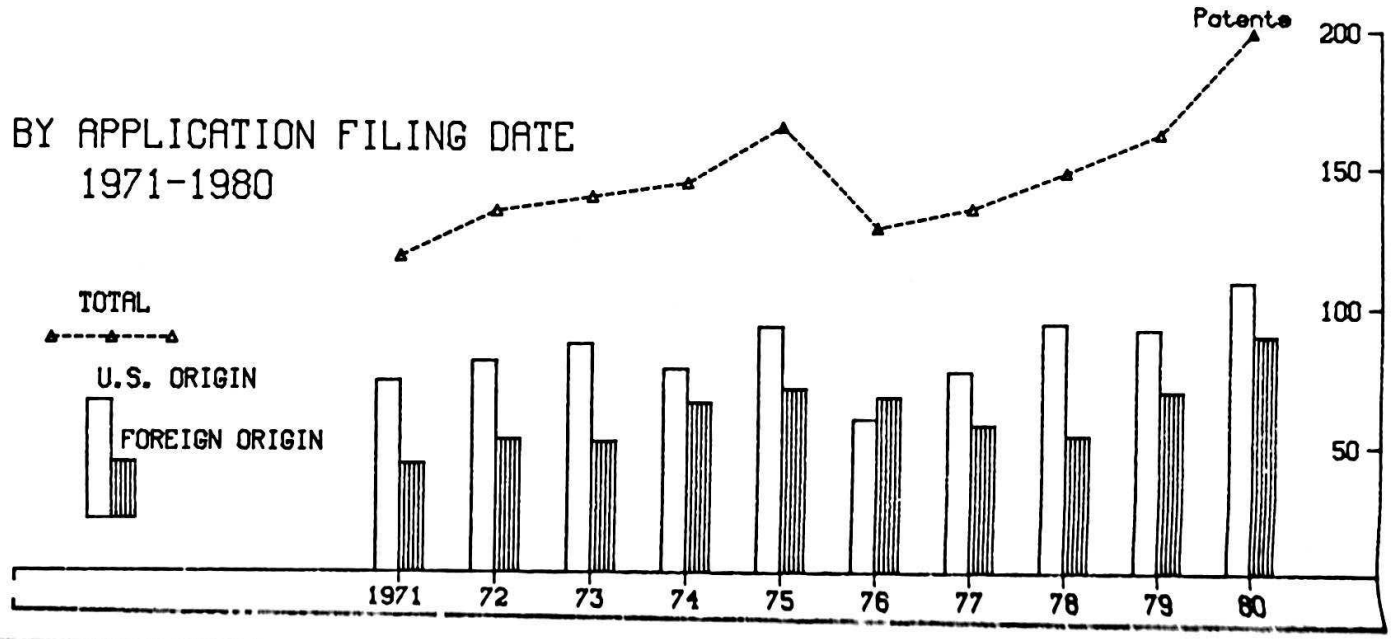
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	34.2%
FOREIGN SHARE	44.6%
CORPORATE OWNED	91.0%
GOVERNMENT OWNED	3.0%
U.S. OWNED OF FOREIGN	16.7%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 370, Subclasses 41-44, 46-50, 53-56, 58-68, 77-117





3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

ORGANIZATIONS ASSIGNED 6 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
259	BELL TELEPHONE LABORATORIES, INC.
112	SIEMENS AG.
105	INTERNATIONAL BUSINESS MACHINES CORP.
76	INTERNATIONAL STANDARD ELECTRIC CORP.
53	NIPPON ELECTRIC CO., LTD.
52	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
45	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
44	U.S. PHILIPS CORP.
43	COMMUNICATIONS SATELLITE CORP.
31	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
30	TELEFONAKTIEBOLAGET LM ERICSSON
29	HITACHI, LTD.
28	BURROUGHS CORP.
28	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
23	UNITED STATES OF AMERICA, NAVY
21	NORTHERN TELECOM LTD.
20	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
20	MOTOROLA INC.
19	KOKUSAI DENSHIN DENWA K.K.
18	ROCKWELL INTERNATIONAL CORP.
17	FUJITSU LTD.
17	RCA CORP.
17	UNITED STATES OF AMERICA, ARMY
17	SOCIETE ANONYME DE TELECOMMUNICATIONS
16	THOMSON-CSF
15	GENERAL ELECTRIC CO.
14	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
13	HONEYWELL INFORMATION SYSTEMS INC.
13	TRW INC.
13	STROMBERG-CARLSON CORP.
11	LICENTIA PATENT-VERWALTUNGS-GMBH
11	POST OFFICE
11	SPERRY CORP.
11	UNITED STATES OF AMERICA, NASA
10	COLLINS RADIO CO.
10	HUGHES AIRCRAFT CO.
10	TEXAS INSTRUMENTS, INC.
10	TOKYO SHIBAURA ELECTRIC CO., LTD.
9	HONEYWELL INC.
9	WESTERN GEOPHYSICAL CO. OF AMERICA
8	PLESSEY HANDEL UND INVESTMENTS AG.
8	SIEMENS CORP.
8	STORAGE TECHNOLOGY CORP.
7	DIGITAL COMMUNICATIONS CORP.
7	HASLER AG.
7	L.M. ERICSSON PTY. LTD.
7	MINNESOTA MINING AND MANUFACTURING CO.
7	RAYTHEON CO.
6	D.D.I. COMMUNICATIONS, INC.
6	GTE SYLVANIA INC.
6	HARRIS CORP.
6	MARTIN-MARIETTA CORP.
6	NCR CORP.
6	NORTH ELECTRIC CO.
6	SATELLITE BUSINESS SYSTEMS
6	UNITED STATES OF AMERICA, AIR FORCE

3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	415	94	118	137	145	155	147	152	155	137	104	108	136	177	185	2365
U.S. ORIGIN	266	61	59	75	87	103	89	81	85	68	61	68	79	93	104	1379
FOREIGN ORIGIN	149	33	59	62	58	52	58	71	70	69	43	40	57	84	81	986
JAPAN	34	8	18	17	11	12	13	8	14	13	8	12	9	25	24	226
WEST GERMANY	35	10	6	10	9	9	14	12	19	9	9	8	14	16	14	194
FRANCE	14	3	6	7	14	12	15	18	14	20	16	7	12	17	18	193
UNITED KINGDOM	36	5	15	8	5	2	7	7	5	6	2	4	8	3	7	120
ITALY		1	4	2	11	3	2	7	7	3	2	1	3	6	5	57
CANADA	3	1	2	4	2	4		3	5	4	2	5	1	10	5	51
SWEDEN	8		2	1	2	3	4	6	3	5	2	1	2	2	1	42
NETHERLANDS	9	3	4	4	3	2	2	2	1	2	1	2	2	3	2	42
SWITZERLAND			2	5		5		3	2	5	1		1		3	27
BELGIUM	7	1											4		1	13
AUSTRALIA				2			1	2		2			1			8
NORWAY	1	1						1								3
ISRAEL								1						1		2
U.S.S.R.					1									1	1	2
SOUTH KOREA																1
LIECHTENSTEIN				1												1
HUNGARY	1															1
MOROCCO				1												1
DENMARK								1								1
NORTH KOREA	1															1
U.S. ORIGIN	266	61	59	75	87	103	89	81	85	68	61	68	79	93	104	1379
U.S. CORP. OWNED	239	51	54	70	79	92	81	73	74	56	56	55	71	80	100	1231
U.S. GOVT. OWNED	20	7	3	2	1	8	4	4	4	8	3	5	4	4		77
U.S. INDIV. OWNED	6	3	2	2	7	3	4	4	6	4	2	5	4	7	3	62
FOREIGN OWNED	1			1					1			3		2	1	9
FOREIGN ORIGIN	149	33	59	62	58	52	58	71	70	69	43	40	57	84	81	986
U.S. OWNED	40	12	14	26	18	16	12	16	7	12	4	5	13	13	11	219
FOREIGN OWNED	109	21	45	36	40	36	46	55	63	57	39	35	44	71	70	767
FOREIGN CORP.	96	17	40	34	38	32	39	47	61	55	35	34	39	62	61	690
FOREIGN GOVT.	7		2				2	2	1	2		1	2	3	2	24
FOREIGN INDIV.	6	4	3	2	2	4	5	6	1		4		3	6	7	53

3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	444	109	118	134	139	144	164	128	135	148	162	199	113	4		2141
U.S. ORIGIN	265	64	74	81	87	78	93	60	77	94	92	109	58	3		1235
FOREIGN ORIGIN	179	45	44	53	52	66	71	68	58	54	70	90	55	1		906
JAPAN	53	8	13	12	10	8	11	15	10	11	17	26	17			211
WEST GERMANY	37	9	5	10	13	9	15	11	13	13	17	16	8			176
FRANCE	16	9	9	12	10	19	16	20	18	12	13	18	14			186
UNITED KINGDOM	38	6	4	3	4	9	5	6	3	9	4	8	2			101
ITALY	6	2	4	9		5	7	6	3		5	4	6			57
CANADA	4	4	2		4	3	5	2	4	3	3	14	1			49
SWEDEN	6	1		3	6	6	4	3	3	2	2	1	1			38
NETHERLANDS	11	1	5	1	2	2	2	2		4	2	2	2			36
SWITZERLAND	4	3	1	2	2	2	3	3	3		1		2	1		27
BELGIUM	1										4	1				6
AUSTRALIA		2			1	2	1		1		1					8
NORWAY	1						1									2
ISRAEL						1							1			2
U.S.S.R.											1		1			2
SOUTH KOREA				1												1
LIECHTENSTEIN	1															1
HUNGARY	1															1
MOROCCO			1													1
DENMARK							1									1
NORTH KOREA																
U.S. ORIGIN	265	64	74	81	87	78	93	60	77	94	92	109	58	3		1235
U.S. CORP. OWNED	234	60	68	71	78	71	82	54	67	77	83	98	55	3		1101
U.S. GOVT. OWNED	24	1	3	5	4	3	5	4	5	6	3	5				68
U.S. INDIV. OWNED	6	2	3	5	5	4	5	2	5	8	6	3	3			57
FOREIGN OWNED	1	1					1			3		3				9
FOREIGN ORIGIN	179	45	44	53	52	66	71	68	58	54	70	90	55	1		906
U.S. OWNED	44	17	19	12	13	19	10	8	7	7	13	15	7	1		192
FOREIGN OWNED	135	28	25	41	39	47	61	60	51	47	57	75	48			714
FOREIGN CORP.	118	26	24	35	36	40	55	59	46	43	52	67	41			642
FOREIGN GOVT.	5	1		1		2	1	1	2	3	1	3	1			21
FOREIGN INDIV.	12	1	1	5	3	5	5		3	1	4	5	6			51

3.2 MULTIPLEX COMMUNICATIONS: TIME DIVISION MULTIPLEXING (TDM) INCLUDING COMBINED FDM/TDM

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1301
TOTAL REFERENCES CITED	7123
U.S. Patent References Cited	6388
Foreign Patent References Cited	223
Other References Cited	512

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	3976
Japan	425
France	407
West Germany	291
United Kingdom	281

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,927,268, Communications Satellite Corp.	26
3,597,549, Bell Telephone Laboratories, Inc.	23
3,956,593, Arthur A. Collins, Inc.	22
3,988,545, International Business Machines Corp.	19
3,749,845, Bell Telephone Laboratories, Inc.	19

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	856
International Business Machines Corp.	363
International Standard Electric Corp.	188
Communications Satellite Corp.	184
Siemens AG.	182

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

DEFINITION

This category includes systems where two or more independent sound signals are reproduced separately to create a sense of depth.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 3.3 are:

U.S. Patent 3,944,749. This invention is an example of an AM stereo system. Such systems are getting increasing interest in view of recent Federal Communications Commission (FCC) regulations permitting their use.

U.S. Patent 4,282,401. This invention is an example of a discrete four channel stereo system.

U.S. Patent 4,359,605. This invention shows a circuit for producing an artificial stereo signal from a monophonic signal.

U.S. Patent 4,388,494. This invention is intended to produce a more realistic stereo sound. Stereo microphone pickups are placed on either side of a dummy head to simulate the ears of a listener.

United States Patent [19]

Kahn

[11] **3,944,749**

[45] **Mar. 16, 1976**

[54] **COMPATIBLE AM STEREOPHONIC RECEIVERS INVOLVING SIDEBAND SEPARATION AT IF FREQUENCY**

[76] Inventor: **Leonard R. Kahn**, 70 N. Grove, Freeport L.I., N.Y. 11520

[22] Filed: **July 10, 1974**

[21] Appl. No.: **487,154**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 251,947, May 10, 1972, abandoned.

[52] **U.S. Cl.** ..... **179/15 BT; 325/36**

[51] **Int. Cl.²** **H04H 5/00**

[58] **Field of Search** ..... 179/15 BT, 15 BM; 325/36, 325/60; 343/200

[56] **References Cited**

UNITED STATES PATENTS

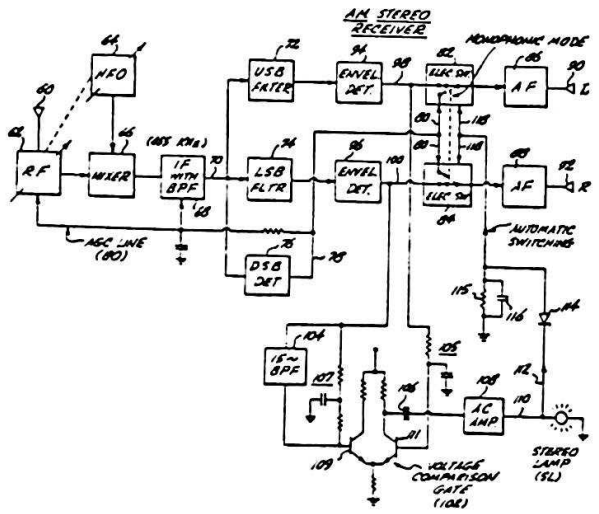
3,167,614	1/1965	Holt et al.	179/15 BT
3,206,550	9/1965	Fink	179/15 BT
3,218,393	11/1965	Kahn	179/15 BT
3,350,645	10/1967	Kahn	325/137

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Graybeal, Barnard, Uhlir & Hughes

[57] **ABSTRACT**

Amplitude modulation (AM) stereophonic transmission receivers for reception of a radiant energy carrier wave with two stereo related signals, each appearing as a first order single-sideband, the carrier wave preferably being also modulated with an infrasonic frequency (e.g. 15 Hz) signal indicating stereo signal presence (with such infrasonic frequency modulation being either amplitude modulated or phase modulated). The upper sideband and the lower sideband portions of the received signal are separately detected and through voltage comparison means are applied to the development of automatic switching control of the detector outputs to deliver as receiver outputs either stereophonically related audio signals in the presence of different upper and lower sideband detector outputs or to deliver monophonically related (i.e. combined) detector outputs in the instance of reception of a monophonically modulated carrier wave. Such voltage comparison means, operating on the respective upper and lower sideband detector outputs, is advantageously activated (i.e. gated) by the presence in at least one detector output of the infrasonic modulation signifying the presence of stereo related modulation of the carrier wave, the output from such voltage comparison means also providing, in addition to the automatic switching of the detector outputs to stereophonically related audio receiver output mode as above indicated, a visual output (suitably in the form of a stereo presence/tuning light) directly and visually indicating to the receiver operator the presence of a stereo signal, and also providing the operator with a means to tune the RF portion of the receiver accurately to the carrier frequency, the proper RF tuning being indicated by maximal intensity of the visual output. Modified forms of receiver circuitry are presented wherein, in a first instance, the IF passband is defined by a double sideband filter and the intelligence is separated into upper sideband and lower sideband portions by separate upper sideband and lower sideband filters, and, in the second instance, the IF passband is defined simply by upper sideband and lower sideband filters with a portion of the filter outputs summated and the envelope thereof separately detected to provide a monophonic audio output and an AGC signal.

10 Claims, 2 Drawing Figures



United States Patent [19]

Takahashi

[11] **4,282,401**

[45] **Aug. 4, 1981**

[54] **SYSTEM FOR TRANSMISSION AND RECEPTION OF DISCRETE FOUR CHANNEL STEREO**

[75] Inventor: **Susumu Takahashi**, Tokyo, Japan

[73] Assignee: **Sansui Electric Company**, Tokyo, Japan

[21] Appl. No.: **210,866**

[22] Filed: **Dec. 22, 1971**

[30] **Foreign Application Priority Data**

Dec. 24, 1970	[JP]	Japan	45-117258
Dec. 30, 1970	[JP]	Japan	45-122306
Apr. 27, 1971	[JP]	Japan	46-27836
Apr. 27, 1971	[JP]	Japan	46-27838
Jun. 2, 1971	[JP]	Japan	46-37888
Jun. 9, 1971	[JP]	Japan	46-40185
Jul. 15, 1971	[JP]	Japan	46-52597
Aug. 12, 1971	[JP]	Japan	46-61252

[51] **Int. Cl.³** **H04H 5/00**

[52] **U.S. Cl.** ..... **179/1 GH**; 179/1 GM; 179/1 GD

[58] **Field of Search** ..... 179/15 BT, 1 GH, 1 GQ, 179/100.4 ST, 100.1 TD, 1 GM

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,573,382	4/1971	Feit	179/15 BT
3,679,832	7/1972	Halpern	179/15 BT
3,708,623	1/1973	Dorren	179/15 BT

OTHER PUBLICATIONS

The Quart Broadcasting System, by Geryon, Audio Magazine, Sep. 1970.
Quadrasonics on the Air, Feldman, Audio Magazine, Jan. 1970.

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Frishauf, Holtz, Goodman and Woodward

[57] **ABSTRACT**

A system for transmission and reception of discrete four channel stereo for utilizing a carrier frequency modulated in accordance with a modulation function of the form:

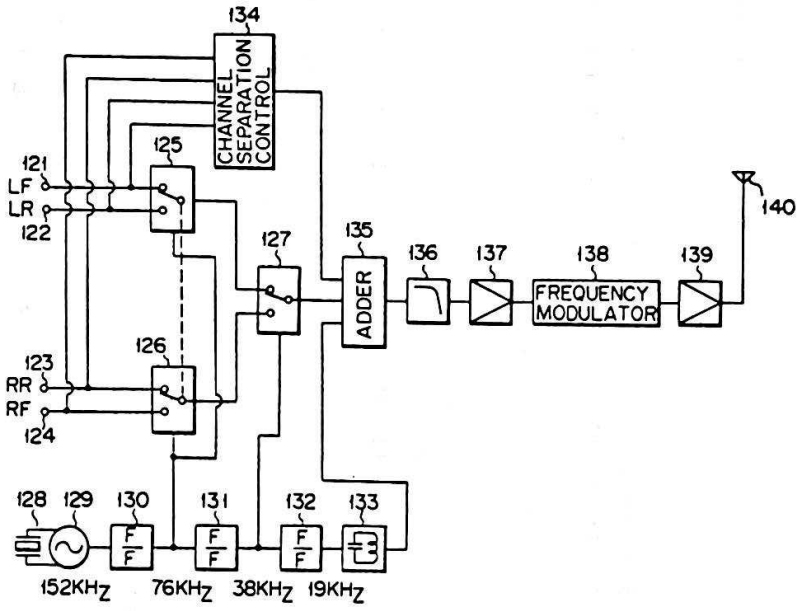
$$f_1(t) = A + B\sin 2\omega t + C\cos 2\omega t + D\sin 4\omega t + K\sin\omega t$$

where

$A = LF + LR + RR + RF$,
$B = LF + LR - RR - RF$,
$C = LF - LR = RR + RF$,
$D = LF - LR + RR - RF$,

LF, LR, RR and RF are audio signals, K is a constant and ω is an angular frequency higher than that of the audio signals.

26 Claims, 37 Drawing Figures



United States Patent [19]

Haramoto et al.

[11] **4,359,605**

[45] **Nov. 16, 1982**

[54] **MONAURAL SIGNAL TO ARTIFICIAL STEREO SIGNALS CONVERTINGS AND PROCESSING CIRCUIT FOR HEADPHONES**

[75] Inventors: **Yutaka Haramoto, Zama; Mitsuru Kikuchi, Kawasaki, both of Japan**

[73] Assignee: **Victor Company of Japan, Ltd., Yokohama, Japan**

[21] Appl. No.: **208,123**

[22] Filed: **Nov. 13, 1980**

[30] **Foreign Application Priority Data**

Nov. 1, 1979 [JP] Japan 54-140480
Nov. 5, 1979 [JP] Japan 54-142929

[51] Int. Cl.³ H04R 5/00
[52] U.S. Cl. ..... 179/1 GP; 179/1 G
[58] Field of Search ..... 179/1 G, 1 GA, 1 GP, 179/1 GQ

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,670,106 6/1972 Orban ..... 179/1 GP
4,039,755 8/1977 Berkovitz ..... 179/1 GP
4,308,424 12/1981 Bice, Jr. ..... 179/1 GP

FOREIGN PATENT DOCUMENTS

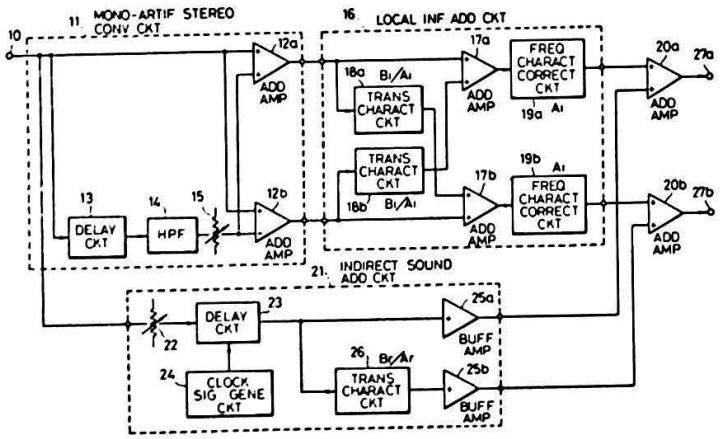
1269187 5/1968 Fed. Rep. of Germany ... 179/1 GP
52-4802 1/1977 Japan ..... 179/1 GP

Primary Examiner—R. J. Hickey
Attorney, Agent, or Firm—Michael N. Meller; Anthony H. Handal

[57] **ABSTRACT**

A monaural signal to artificial stereo signals converting and processing circuit for headphones comprises, a circuit which converts a monaural signal into artificial stereo signals, a circuit which adds localizing information of imaginary sources to the artificial stereo signals thus obtained, and a circuit which adds imaginary indirect sounds to the artificial stereo signals added with the localizing information. Due to the addition of the indirect sounds, the sound expansion felt by a listener listening to a headphone expands to regions outside the listener's head.

6 Claims, 5 Drawing Figures



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United States Patent [19]

Schöne et al.

[11] **4,388,494**

[45] **Jun. 14, 1983**

[54] **PROCESS AND APPARATUS FOR IMPROVED DUMMY HEAD STEREOPHONIC REPRODUCTION**

[76] Inventors: **Peter Schöne, No. 13, Rosenstrasse, 8011 Aschheim; Jürgen Ölmann, No. 5, Davidstrasse, 8000 Munich 89; Helmut Lamparter, No. 36, Rosenstrasse, 8011 Kirchheim, all of Fed. Rep. of Germany**

[21] Appl. No.: **222,475**

[22] Filed: **Jan. 5, 1981**

[30] **Foreign Application Priority Data**

Jan. 12, 1980 [DE] Fed. Rep. of Germany 3001007
Feb. 2, 1980 [DE] Fed. Rep. of Germany 3003852

[51] Int. Cl.³ H04S 1/00
[52] U.S. Cl. ..... 179/1 G; 179/1 GP
[58] Field of Search ..... 179/1 G, 1 GP

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,985,960 10/1976 Wallace ..... 179/1 G
4,139,728 2/1979 Haramoto et al. ..... 179/1 G
4,192,969 3/1980 Iwahara ..... 179/1 G
4,209,665 6/1980 Iwahara ..... 179/1 G
4,309,570 1/1982 Carver ..... 179/1 G

FOREIGN PATENT DOCUMENTS

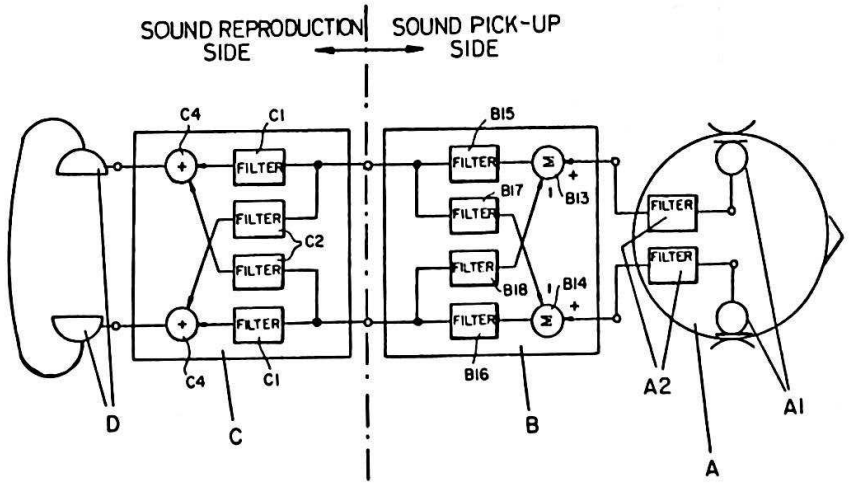
2822735 11/1979 Fed. Rep. of Germany ..... 179/1 G

Primary Examiner—A. D. Pellinen
Attorney, Agent, or Firm—John C. Smith, Jr.

[57] **ABSTRACT**

In stereophonic reproduction using a dummy head process, the frequency responses of the microphones are equalized by free-field matching filters to provide overall transfer constants independent of frequency. Signals produced by the above-equalized dummy head apparatus are applied to a decoupling filter which corrects for the directional pattern of the dummy head. The decoupled signals are suitable for loudspeaker reproduction. The decoupled signals can be further applied to a second decoupling network which can be adjusted to produce headphone stereophonic signals matched to a listener's individual directional hearing pattern.

11 Claims, 21 Drawing Figures



3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

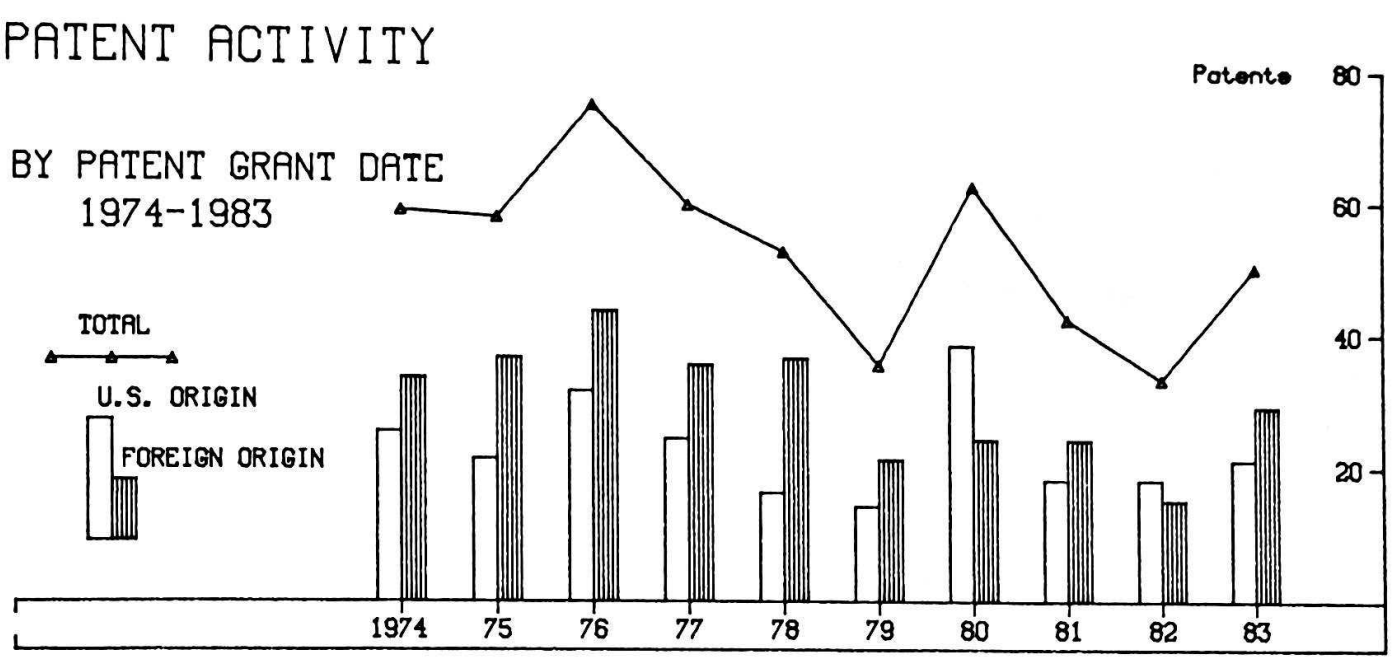
ACTIVITY SUMMARY

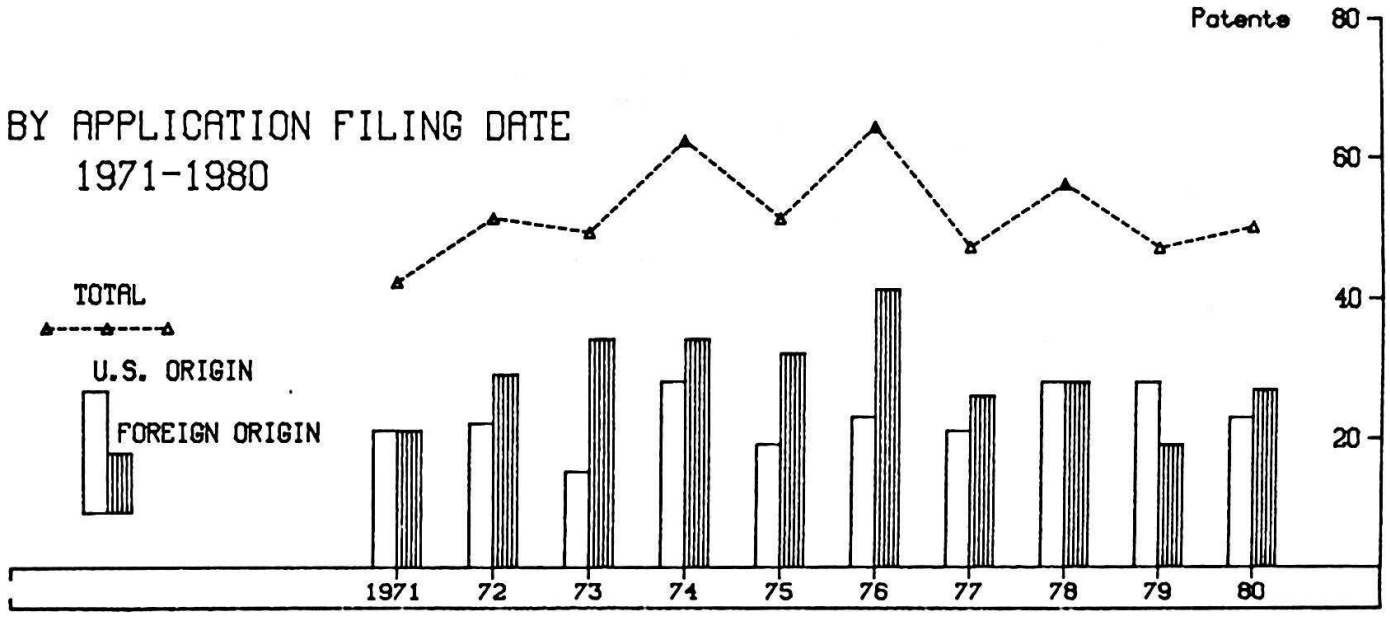
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	24.0%
FOREIGN SHARE	54.4%
CORPORATE OWNED	72.0%
GOVERNMENT OWNED	1.6%
U.S. OWNED OF FOREIGN	10.3%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 381, Subclasses 1-28





3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

ORGANIZATIONS ASSIGNED 3 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
42	VICTOR CO. OF JAPAN, LTD.
39	SONY CORP.
33	MOTOROLA INC.
32	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
30	SANSUI ELECTRIC CO., LTD.
25	CBS INC.
25	PIONEER ELECTRONIC CORP.
16	ZENITH RADIO CORP.
13	RCA CORP.
13	U.S. PHILIPS CORP.
11	HITACHI, LTD.
11	NIPPON GAKKI SEIZO K.K.
9	NATIONAL RESEARCH DEVELOPMENT CORP.
8	HARRIS CORP.
7	GENERAL MOTORS CORP.
7	TRIO K.K.
6	NIPPON COLUMBIA K.K.
5	ELECTROHOME LTD.
5	GENERAL ELECTRIC CO.
5	GTE SYLVANIA INC.
4	MAGNAVOX CO.
4	MAGNAVOX CONSUMER ELECTRONICS CO.
4	NATIONAL SEMICONDUCTOR CORP.
4	SANYO ELECTRIC CO., LTD.
4	SIEMENS AG.
3	ALPS MOTOROLA, INC.
3	BELL TELEPHONE LABORATORIES, INC.
3	BOSE CORP.
3	CLARION CO., LTD.
3	KOSS CORP.
3	MCINTOSH LABORATORY INC.
3	MITSUBISHI DENKI K.K.
3	OLYMPUS OPTICAL CO., LTD.
3	QUADRACAST SYSTEMS, INC.
3	SUPERSCOPE, INC.
3	TOKYO SHIBAURA ELECTRIC CO., LTD.
3	WESTINGHOUSE ELECTRIC CORP.

3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	232	19	19	26	36	58	57	74	59	52	35	62	42	33	50	854
U.S. ORIGIN	187	13	16	20	18	25	21	31	24	16	14	38	18	18	21	480
FOREIGN ORIGIN	45	6	3	6	18	33	36	43	35	36	21	24	24	15	29	374
JAPAN	14	1	1	3	14	27	30	32	28	27	18	19	13	14	19	260
WEST GERMANY	11	1		1	1	2	5	4	3	1			2		4	35
NETHERLANDS	9	1	1		1	1		1		1		2	3		3	23
UNITED KINGDOM	3					1		3	2	4	3		1		2	19
CANADA	4	3	1		1					1		2	1			13
SWITZERLAND							1	2	1							4
SWEDEN									1	1			1		1	4
FRANCE								1				1		1		3
AUSTRIA										1			2			3
U.S.S.R.	1				1	1										3
CZECHOSLOVAKIA				2												2
TANZANIA	1															1
LUXEMBOURG						1										1
ITALY													1			1
BURMA	1															1
DENMARK	1															1
U.S. ORIGIN	187	13	16	20	18	25	21	31	24	16	14	38	18	18	21	480
U.S. CORP. OWNED	162	10	13	15	14	20	17	20	13	12	9	17	9	12	15	358
U.S. GOVT. OWNED						2										2
U.S. INDIV. OWNED	25	3	3	5	4	3	4	11	11	4	5	20	9	6	6	119
FOREIGN OWNED												1				1
FOREIGN ORIGIN	45	6	3	6	18	33	36	43	35	36	21	24	24	15	29	374
U.S. OWNED	16	2	1		1	2	2	3	4		2	2	4		3	42
FOREIGN OWNED	29	4	2	6	17	31	34	40	31	36	19	22	20	15	26	332
FOREIGN CORP.	25	4	2	5	15	29	34	38	30	33	17	18	12	15	20	297
FOREIGN GOVT.													1		1	2
FOREIGN INDIV.	4			1	2	2		2	1	3	2	4	7		5	33

3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	110	28	42	51	49	62	51	64	47	56	47	50	29	1		687
U.S. ORIGIN	79	20	21	22	15	28	19	23	21	28	28	23	10	1		338
FOREIGN ORIGIN	31	8	21	29	34	34	32	41	26	28	19	27	19			349
JAPAN	12	5	17	26	26	25	26	31	19	21	13	21	13			255
WEST GERMANY	5	1	1	1	6	3	1	4		1	1	2	2			28
NETHERLANDS	5	1		1		1	1		1	3	1	1	2			17
UNITED KINGDOM				1	1	2	2	3	5			1	1			16
CANADA	7		1						1	1	1	1				12
SWITZERLAND						3	1									4
SWEDEN								2		1			1			4
FRANCE							1			1		1				3
AUSTRIA								1			2					3
U.S.S.R.			2								1		1			4
CZECHOSLOVAKIA	1	1														2
TANZANIA	1															1
LUXEMBOURG					1											1
ITALY											1					1
BURMA																
DENMARK																
U.S. ORIGIN	79	20	21	22	15	28	19	23	21	28	28	23	10	1		338
U.S. CORP. OWNED	62	14	17	19	10	18	10	19	13	11	16	14	9			232
U.S. GOVT. OWNED			1		1											2
U.S. INDIV. OWNED	17	6	3	3	4	10	9	3	8	17	12	9	1	1		103
FOREIGN OWNED								1								1
FOREIGN ORIGIN	31	8	21	29	34	34	32	41	26	28	19	27	19			349
U.S. OWNED	9	1	1	1	2	4	2	3	1	3	2		3			32
FOREIGN OWNED	22	7	20	28	32	30	30	38	25	25	17	27	16			317
FOREIGN CORP.	19	6	18	28	31	27	29	36	23	20	11	23	13			284
FOREIGN GOVT.						1							1			2
FOREIGN INDIV.	3	1	2		1	2	1	2	2	5	6	4	2			31

3.3 MULTIPLEX COMMUNICATIONS: BINAURAL AND STEREOPHONIC SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	464
TOTAL REFERENCES CITED	3055
U.S. Patent References Cited	2666
Foreign Patent References Cited	141
Other References Cited	248

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	1268
Japan	503
West Germany	58
Netherlands	53
United Kingdom	40

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,686,471, Victor Co. of Japan, Ltd.	26
3,708,623, Quadracast Systems, Inc.	22
3,218,393, Unassigned	19
3,068,475, RCA Corp.	18
3,823,268, McIntosh Laboratory, Inc.	15

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Victor Co. of Japan, Ltd.	107
Motorola Inc.	104
Sony Corp.	95
Sansui Electric Co., Ltd.	73
CBS, Inc.	72

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

DEFINITION

Although the patents in the preceding three profiles constitute the bulk of multiplex patenting activity, several other multiplexing techniques are in common use. They are covered here together with duplex, diplex, and testing systems.

Some of the other multiplexing techniques are: pulse width modulation, pulse position modulation, and phase modulation.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 3.4 are:

U.S. Patent 4,345,323. This invention illustrates one of many pulse modulation techniques useful in a multiplexing system.

U.S. Patent 4,380,062. This invention is a duplex system suitable for use in a subscriber carrier system. This system allows twice the number of signals to be sent as a typical carrier system.

U.S. Patent 4,381,560. This patent is an example of the use of plural, diverse modulation techniques in a single multiplexing system.

U.S. Patent 4,383,312. This patent is an example of a testing apparatus for use in a multiplex system. This system avoids using multiplex system computers as test devices and the associated software problems.

United States Patent [19]

Chang

[11] **4,345,323**

[45] **Aug. 17, 1982**

[54] **PULSE DURATION DIGITAL MULTIPLEXING SYSTEM**

[75] Inventor: **Paul S. Chang, Harrisburg, Pa.**

[73] Assignee: **AMP Incorporated, Harrisburg, Pa.**

[21] Appl. No.: **110,422**

[22] Filed: **Jan. 7, 1980**

[51] Int. Cl.³ **H04J 15/00**

[52] U.S. Cl. 370/9; 370/112

[58] Field of Search 370/9, 112, 119; 375/22

[56] **References Cited**

U.S. PATENT DOCUMENTS

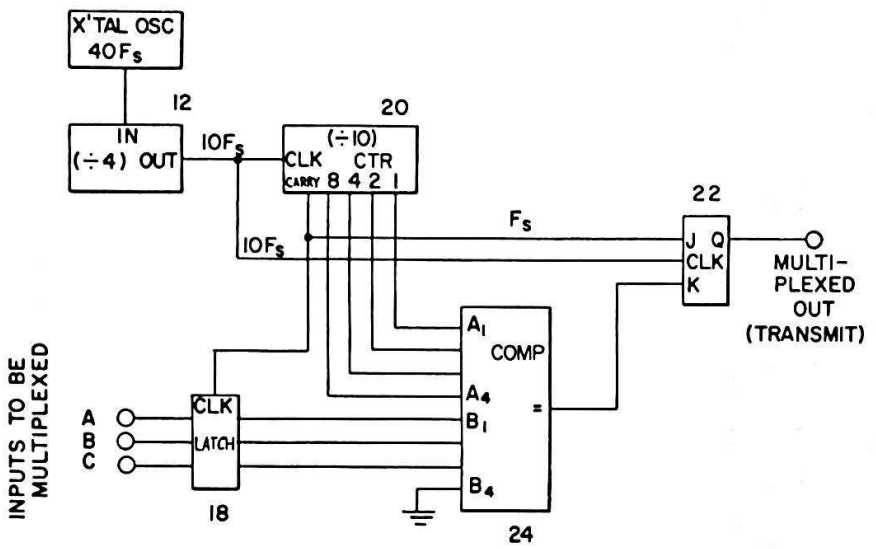
3,124,750	3/1964	McLean et al.	370/9
3,281,806	10/1966	Lawrance et al.	375/22
3,337,691	8/1967	Litchman	370/112
3,623,105	11/1971	Kamen	375/22
3,808,376	4/1974	Melvin	370/112
3,825,693	7/1974	Smith et al.	179/99
3,855,419	12/1974	Hurford	370/9
4,085,287	4/1978	Kullmann et al	375/22

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Allan B. Osborne

[57] **ABSTRACT**

Method for multiplexing of digital data is disclosed, to enable simultaneous transmission/reception of a number of digital signals over a single communication channel. A plurality of inputs are clocked in and assigned respective binary coded weights. The combined binary coded decimal value of the inputs determines the time duration of a generated digital pulse. The multiplexed data is thereby represented by the length or duration of the pulse. At the receiving end, the pulse is amplified and quantized to digital level and outputs generated in correspondence to the digital transmitter inputs.

10 Claims, 14 Drawing Figures



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United States Patent [19]

Stuart et al.

[11] **4,380,062**

[45] **Apr. 12, 1983**

[54] **COMMUNICATION SYSTEM PROVIDING SIMULTANEOUS TWO-WAY TRANSMISSION**

[75] Inventors: **Richard L. Stuart, Columbia, Md.; Fred C. Killmeyer, Palm Bay, Fla.**

[73] Assignee: **Rixon, Inc., Silver Spring, Md.**

[21] Appl. No.: **256,422**

[22] Filed: **Apr. 22, 1981**

[51] Int. Cl.³ **H04B 1/56**

[52] U.S. Cl. 370/20; 370/24

[58] Field of Search 370/20, 24, 27, 19, 370/71

[56] **References Cited**

U.S. PATENT DOCUMENTS

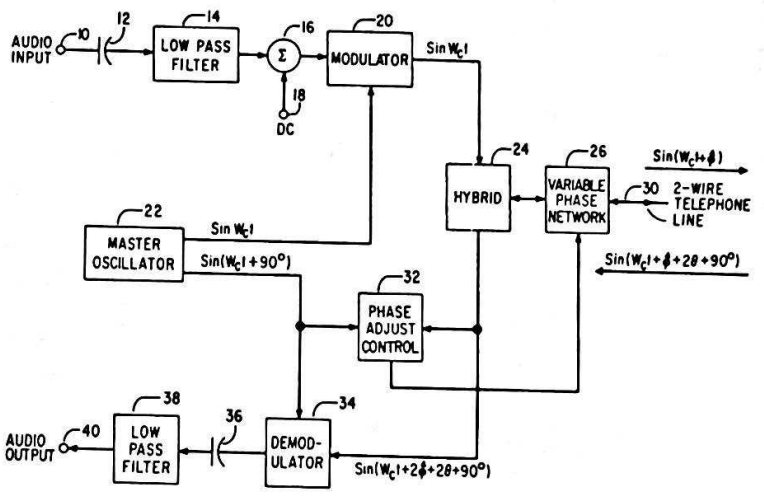
3,082,296	3/1963	Caruthers	370/20
3,601,538	8/1971	May et al.	370/71
3,626,297	12/1971	Green et al.	370/20
3,700,817	10/1972	Garcia et al.	370/71
3,732,375	5/1973	Kuribayashi	370/20
3,733,438	5/1973	Haley et al.	370/121
3,758,719	9/1973	Klose	370/29
3,775,561	11/1973	Guckel	370/27
3,809,816	5/1974	Reed et al.	370/30
3,822,366	7/1974	O'Dea et al.	370/71
3,836,720	9/1974	Getgen	370/51
3,859,469	1/1975	Getgen	370/30
4,075,427	2/1978	Mattson et al.	370/20

Primary Examiner—Douglas W. Olms
Attorney, Agent, or Firm—Dale Gaudier

[57] **ABSTRACT**

A two-wire, carrier-type communication system is provided which enables simultaneous two-way transmission over two-wire circuits in the same spectrum. Carrier signals in quadrature are used to allow separation of signals within the same frequency spectrum. The carrier recovered at each subscriber station is used to demodulate the received signal and, after being phase shifted 90°, is applied as carrier to the transmitter modulator. The transmitters at the subscriber stations are thus the same as that at the central office but are locked to the receiver and 90° out of phase. A bidirectional control phase adjustment network at the central station adjusts the phase of the signal received thereby until the received carrier is 90° out of phase with the transmit carrier.

17 Claims, 4 Drawing Figures



United States Patent [19]

Farrow

[11] **4,381,560**

[45] **Apr. 26, 1983**

[54] **MULTIPLEX TRANSMITTER APPARATUS**

[75] Inventor: **Cecil W. Farrow, Highlands, N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **200,414**

[22] Filed: **Oct. 24, 1980**

[51] **Int. Cl.**³ **H04J 3/02**

[52] **U.S. Cl.** **370/11; 370/112**

[58] **Field of Search** 370/11, 100, 105, 112; 375/42, 56

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,128,342	4/1964	Baker .	
3,564,412	2/1971	Whang et al. .	
3,619,503	11/1971	Ragsdale .	
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OTHER PUBLICATIONS

"Performance of Combined Amplitude and Phase-Modulated Communication Systems" IRE Transactions on Communications Systems, vol. CS-8, No. 4, pp. 232-237, Dec., 1960.

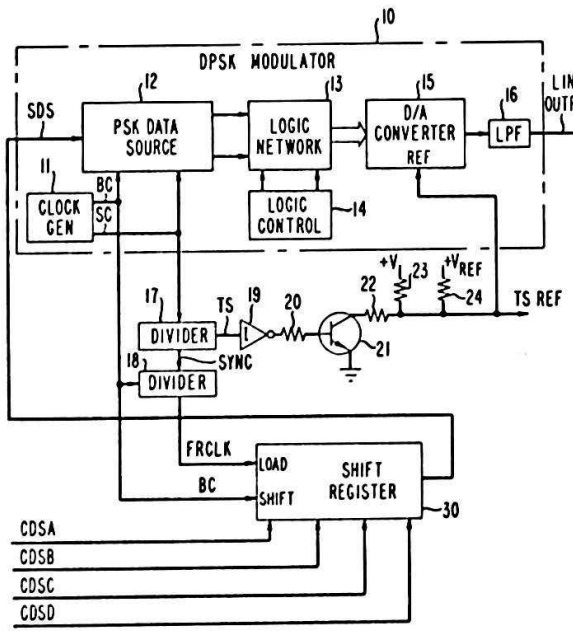
Primary Examiner—Gerald L. Brigance

Attorney, Agent, or Firm—Gregory C. Ranieri

[57] **ABSTRACT**

Combined amplitude and phase modulation of a multiplexed serial data stream is employed to generate a composite signal for transmission to a receiver. The composite signal includes a prescribed timing signal identifying a predetermined bit position in at least each n^{th} symbol and group of n·M bits in the serial data stream. The timing signal forms the amplitude modulation component of the composite signal and is utilized by the receiver for properly resolving an n-fold ambiguity which arises when each symbol includes a nonintegral rational number of frames.

5 Claims, 2 Drawing Figures



United States Patent [19]

Reed

[11] **4,383,312**

[45] **May 10, 1983**

[54] **MULTIPLEX SYSTEM TESTER**

[75] Inventor: **Robert C. Reed, San Diego, Calif.**

[73] Assignee: **The United States of America as represented by the Secretary of the Navy, Washington, D.C.**

[21] Appl. No.: **211,011**

[22] Filed: **Nov. 28, 1980**

[51] **Int. Cl.**³ G06F 11/00; G01R 31/28; H04B 3/46; H04J 3/14

[52] **U.S. Cl.** **370/13; 371/27**

[58] **Field of Search** ..... 370/15, 13, 17, 29, 370/48, 100; 371/27, 20, 25, 28, 15; 324/73 R; 178/69 A, 69 G

[56] **References Cited**

U.S. PATENT DOCUMENTS

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4,222,514	9/1980	Bass	371/27

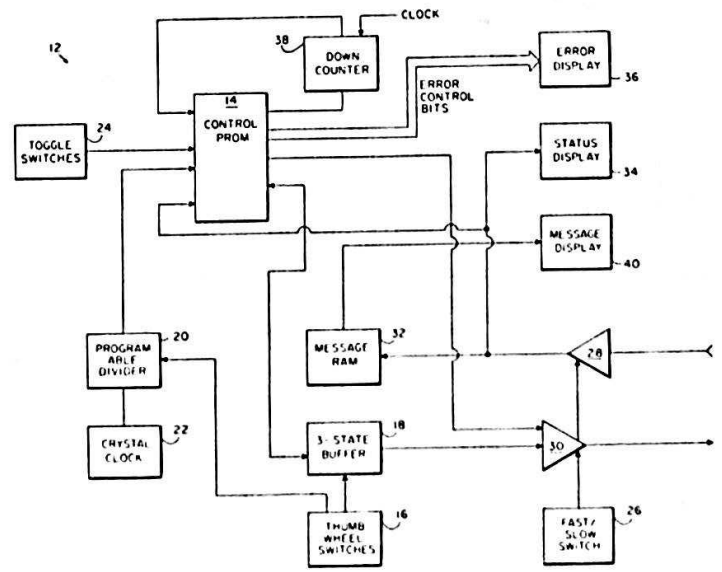
Primary Examiner—Thomas A. Robinson

Attorney, Agent, or Firm—Robert F. Beers; Ervin F. Johnston; Harvey Fendelman

[57] **ABSTRACT**

An apparatus for testing a data multiplex transmission system by providing a simulated source and sink of data for the multiplex transmission system that is compatible with the multiplex system and complies with the protocol of the Input/Output modules of the multiplex system. A programmable read only memory is programmable by means of toggle and thumbwheel switches to selectively and variably control the protocol, the length, the rate, the destination and the content of the data message. A status display is connected to the programmable read only memory to indicate the current point of progression of its programmable sequence. An error detector is connected to the programmable read only memory for determining whether the memory has stalled at a point of progression and an error display is also connected to the programmable read only memory to indicate and identify the error when this stall condition has occurred. A random access memory is included in the apparatus for storing the data received by it and a display is provided for displaying the contents of the random access memory.

10 Claims, 1 Drawing Figure



3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

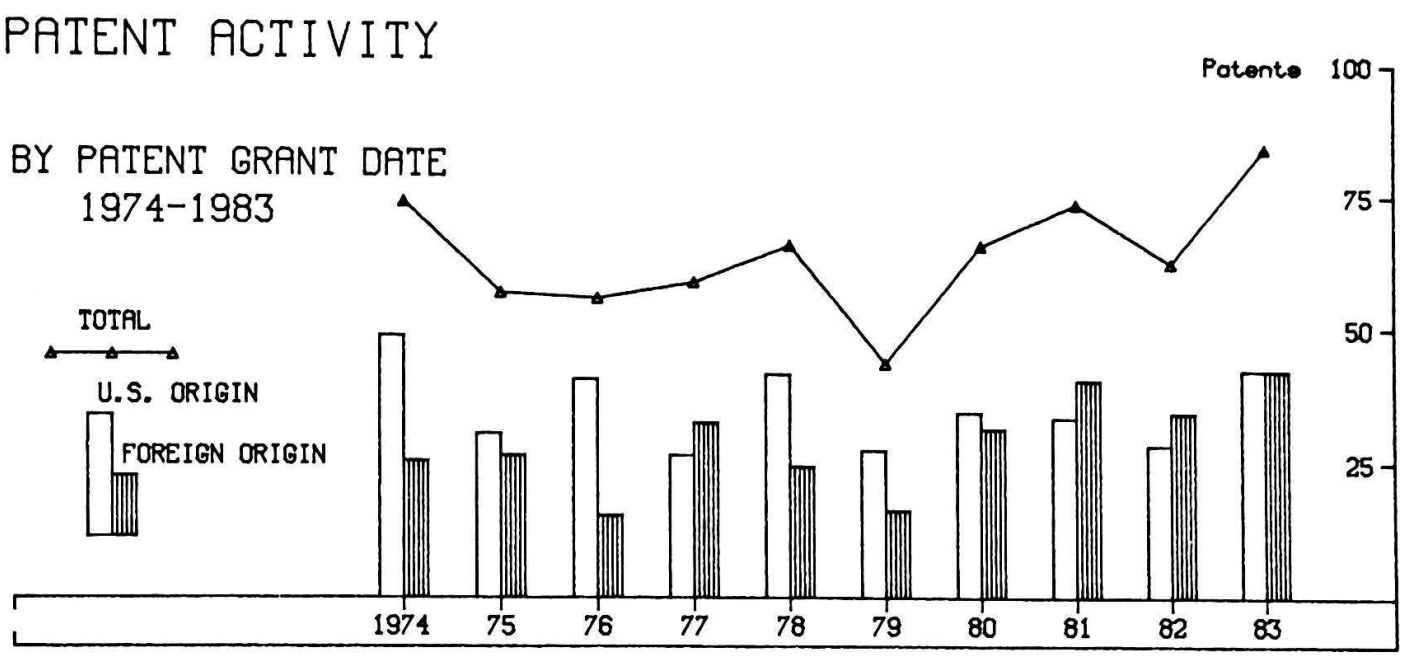
ACTIVITY SUMMARY

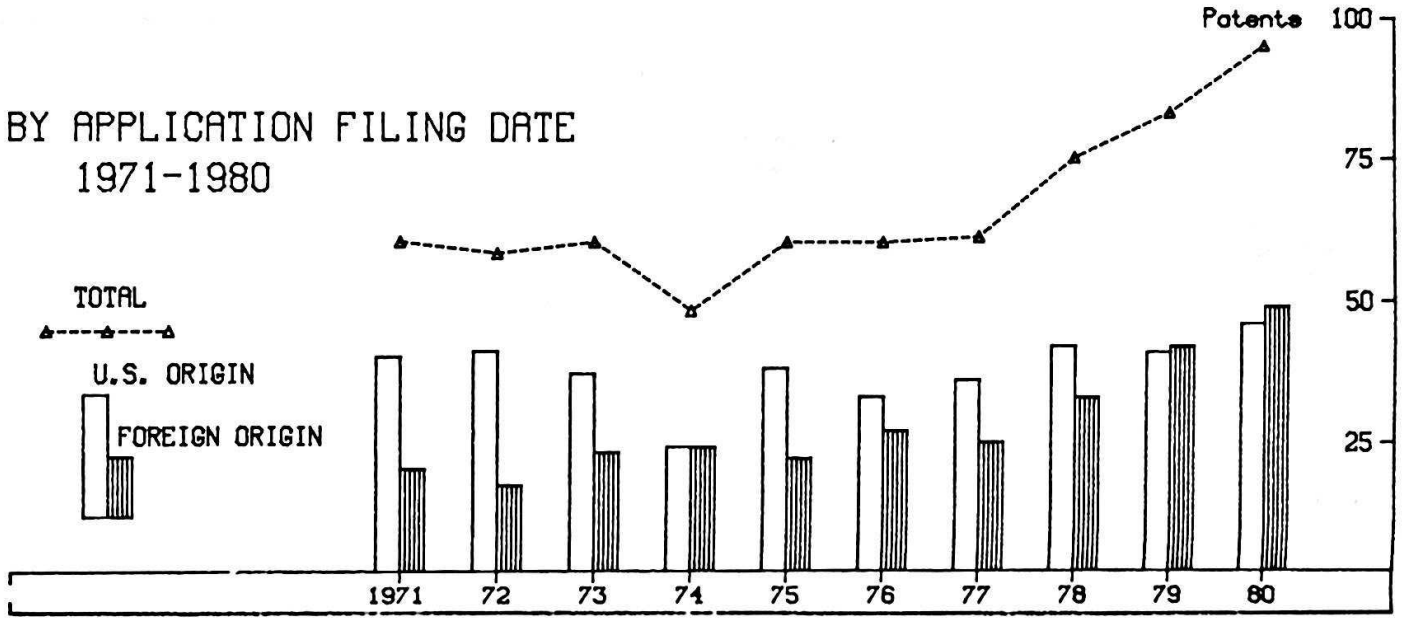
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	34.5%
FOREIGN SHARE	53.0%
CORPORATE OWNED	87.2%
GOVERNMENT OWNED	4.6%
U.S. OWNED OF FOREIGN	13.8%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 370, Subclasses 5-40, 51, 52, 118, 119





3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

ORGANIZATIONS ASSIGNED 4 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
99	BELL TELEPHONE LABORATORIES, INC.
46	SIEMENS AG.
40	INTERNATIONAL STANDARD ELECTRIC CORP.
36	INTERNATIONAL BUSINESS MACHINES CORP.
24	U.S. PHILIPS CORP.
22	NIPPON ELECTRIC CO., LTD.
21	MOTOROLA INC.
20	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
19	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
17	ROCKWELL INTERNATIONAL CORP.
16	UNITED STATES OF AMERICA, NAVY
13	COMMUNICATIONS SATELLITE CORP.
11	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
11	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
11	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
11	UNITED STATES OF AMERICA, NASA
10	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
10	NORTHERN TELECOM LTD.
9	RCA CORP.
9	UNITED STATES OF AMERICA, ARMY
8	GENERAL ELECTRIC CO.
8	SOCIETE ANONYME DE TELECOMMUNICATIONS
8	THOMSON-CSF
7	HITACHI, LTD.
6	COLLINS RADIO CO.
6	GENERAL DATACOMM INDUSTRIES, INC.
6	SPERRY CORP.
6	TELEFONAKTIEBOLAET LM ERICSSON
6	TEXAS INSTRUMENTS, INC..
6	TOKYO SHIBAURA ELECTRIC CO., LTD.
6	UNITED STATES OF AMERICA, AIR FORCE
5	BENDIX CORP.
5	BURROUGHS CORP.
5	KOKUSAI DENSHIN DENWA K.K.
5	LITTON SYSTEMS INC.
5	PLESSEY HANDEL UND INVESTMENTS AG.
5	TRW INC.
4	LICENTIA PATENT-VERWALTUNGS-GMBH
4	MARTIN-MARIETTA CORP.
4	NCR CORP.
4	PATELHOLD PATENTVERWERTUNGS- & LEKTRO-HOLDING AG.
4	POST OFFICE
4	RAYTHEON CO.
4	STROMBERG-CARLSON CORP.
4	WESCOM SWITCHING, INC.
4	WESTINGHOUSE ELECTRIC CORP.

3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	183	58	59	64	77	73	56	55	58	65	43	65	73	62	84	1075
U.S. ORIGIN	124	38	32	43	54	48	30	40	26	41	27	34	33	28	42	640
FOREIGN ORIGIN	59	20	27	21	23	25	26	15	32	24	16	31	40	34	42	435
JAPAN	8		6	3	10	10	4	2	9	4	3	5	10	7	8	89
WEST GERMANY	16	4	3	4	3	3	6	4	8	3	5	6	6	7	9	87
FRANCE	2	3	3	3	2	2	9	2	4	7	2	7	7	6	12	71
UNITED KINGDOM	10	5	5	2	4	2	3	1	4	1	1	3	7	2	4	54
ITALY		2	5	2	2	2	4	2	2	2	2	2	1	5	4	37
CANADA	2	1		3				2		1	1	6	5	2	3	26
NETHERLANDS	4	1	3	2	1	1		1	1	3	1		2	2		22
SWEDEN	7				1	1		1	2	2		1	1		1	17
SWITZERLAND		1	2	1		3			1	1	1			2		12
BELGIUM	7	3		1								1				11
NORWAY	1								1							3
ISRAEL															1	1
AUSTRALIA													1			1
BRAZIL	1															1
TURKEY	1															1
CHINA P.REP.						1								1		1
DENMARK																1
U.S. ORIGIN	124	38	32	43	54	48	30	40	26	41	27	34	33	28	42	640
U.S. CORP. OWNED	106	33	29	38	44	39	21	38	21	33	25	27	26	23	41	544
U.S. GOVT. OWNED	7	4		3	6	4	6	1	3	5	2	2	3	2	1	49
U.S. INDIV. OWNED	10	1	3	2	4	4	3	1	2	3		4	4	3		44
FOREIGN OWNED	1					1						1				3
FOREIGN ORIGIN	59	20	27	21	23	25	26	15	32	24	16	31	40	34	42	435
U.S. OWNED	17	12	5	13	3	6	8	1	1	5		6	8	3	5	93
FOREIGN OWNED	42	8	22	8	20	19	18	14	31	19	16	25	32	31	37	342
FOREIGN CORP.	40	7	20	7	20	18	15	12	28	17	16	20	25	30	30	305
FOREIGN GOVT.	1						1	1	2			2	2		2	11
FOREIGN INDIV.	1	1	2	1		1	2	1	1	2		3	5	1	5	26

3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	218	65	60	58	60	48	60	60	61	75	83	95	33	4		980
U.S. ORIGIN	139	46	40	41	37	24	38	33	36	42	41	46	11	3		577
FOREIGN ORIGIN	79	19	20	17	23	24	22	27	25	33	42	49	22	1		403
JAPAN	12	5	9	5	6	3	2	11	3	4	12	10	4			86
WEST GERMANY	16	5	2	3	4	5	6	3	8	6	9	7	6			80
FRANCE	8	2	2	1	5	7	3	5	5	6	9	12	5			70
UNITED KINGDOM	14	3	3	1	3	3	2	2	2	7	3	4	1			48
ITALY	8	1		4	2	3	3	2	2	2	1	5	4			37
CANADA	2	1	2			1	1		2	5	4	5	1	1		25
NETHERLANDS	7	1	2			1	2	1	1	1	2	2				20
SWEDEN	1			1	1	1	1	2	1	1	1	1				11
SWITZERLAND	4			2	1		1	1	1			2				12
BELGIUM	6	1														7
NORWAY	1						1			1						3
ISRAEL													1			1
AUSTRALIA											1					1
BRAZIL																
TURKEY																
CHINA P.REP.					1											1
DENMARK												1				1
U.S. ORIGIN	139	46	40	41	37	24	38	33	36	42	41	46	11	3		577
U.S. CORP. OWNED	123	40	33	35	26	22	33	27	30	34	35	41	11	3		493
U.S. GOVT. OWNED	7	3	6	3	5	2	3	3	4	3	2	3				44
U.S. INDIV. OWNED	9	3	1	3	5		2	3	2	4	4	2				38
FOREIGN OWNED					1					1						2
FOREIGN ORIGIN	79	19	20	17	23	24	22	27	25	33	42	49	22	1		403
U.S. OWNED	26	8	6	3	8	4	2	2	2	7	8	4	3			83
FOREIGN OWNED	53	11	14	14	15	20	20	25	23	26	34	45	19	1		320
FOREIGN CORP.	49	10	14	13	14	15	19	23	21	21	30	38	17			284
FOREIGN GOVT.	1					3	1	1		2	1	2				11
FOREIGN INDIV.	3	1		1	1	2		1	2	3	3	5	2	1		25

3.4 MULTIPLEX COMMUNICATIONS: OTHER MULTIPLEXING METHODS, DUPLEX, DIPLEX, AND TESTING

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	561
TOTAL REFERENCES CITED	3688
U.S. Patent References Cited	3356
Foreign Patent References Cited	102
Other References Cited	230

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	1614
Japan	168
France	154
West Germany	134
United Kingdom	119

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,937,882, Vadic Corp.	9
4,064,369, North Electric Co.	7
3,927,268, Communications Satellite Corp.	7
3,892,923, U.S. Philips Corp.	7
3,886,318, International Standard Electric Corp.	7

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	306
International Standard Electric Corp.	105
International Business Machines Corp.	93
Siemens AG.	65
International Telephone & Telegraph Corp.	48

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

4.0 ANALOG CARRIER WAVE COMMUNICATIONS

CONTENTS

4.0 ANALOG CARRIER WAVE COMMUNICATIONS

INTRODUCTION

Analog carrier wave systems are composed of carrier waves and analog signals. The carrier wave is a signal of constant amplitude, frequency, and phase. The analog signal has a continuously varying amplitude. The carrier wave serves as the vehicle for transmitting the analog signal, which conveys information by having at least one of the carrier wave's characteristics varied. This variation is called modulation and is dependent upon variations in the analog signal.

The continuously varying amplitude of the analog signal causes a proportionate change in either the amplitude or frequency of the carrier wave. This modulation of the carrier wave is the source of the familiar radio terms AM (amplitude modulation) and FM (frequency modulation). Several modulation techniques can be used simultaneously to transmit several signals.

In order to receive and reproduce the information signal, specific circuits are designed for reversing the modulation process, i.e., demodulation. In the demodulation process the variations in the characteristics of the carrier wave are detected and a signal proportionate to these variations is recreated. The recreated signal is a replica of the original continuously varying analog signal.

This section presents as distinct areas the circuits and systems used in transmitters, receivers, and transceivers.

4.0 ANALOG CARRIER WAVE COMMUNICATIONS

ACTIVITY SUMMARY

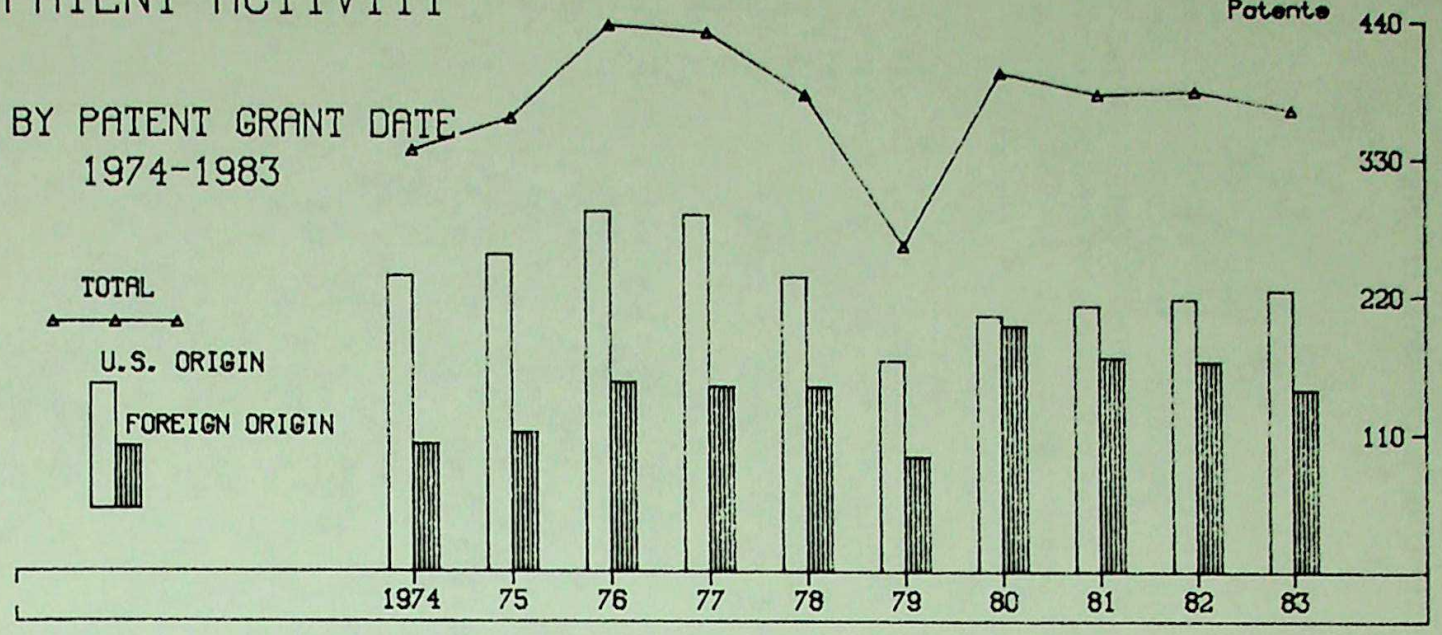
ACTIVITY INDICES (1981 - 1983)	
3-YEAR/10-YEAR SHARE	30.5%
FOREIGN SHARE	42.5%
CORPORATE OWNED	85.2%
GOVERNMENT OWNED	3.3%
U.S. OWNED OF FOREIGN	7.7%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

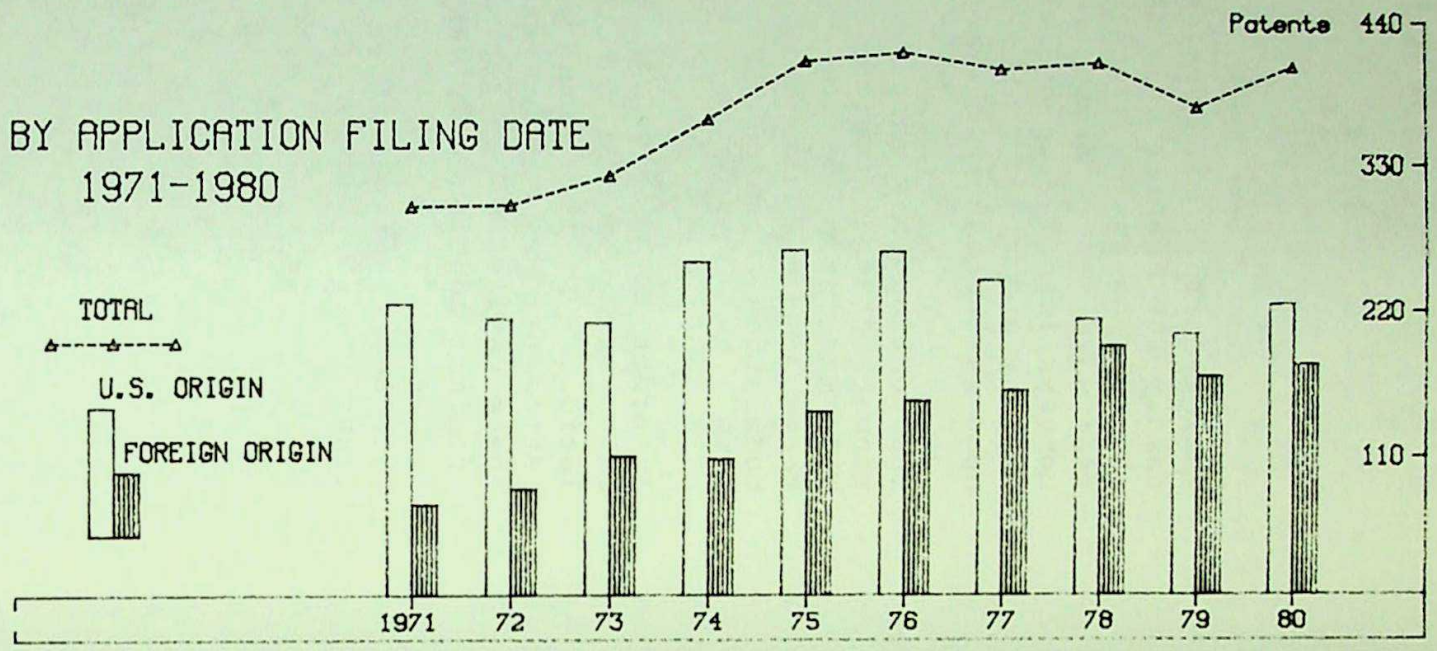
Class 455, Subclasses 1-355

PATENT ACTIVITY

BY PATENT GRANT DATE
1974-1983



BY APPLICATION FILING DATE
1971-1980



4.0 ANALOG CARRIER WAVE COMMUNICATIONS

ORGANIZATIONS ASSIGNED 14 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
347	MOTOROLA INC.
256	RCA CORP.
169	BELL TELEPHONE LABORATORIES, INC.
138	UNITED STATES OF AMERICA, NAVY
133	SONY CORP.
132	GENERAL ELECTRIC CO.
122	U.S. PHILIPS CORP.
120	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
119	ZENITH RADIO CORP.
97	NIPPON ELECTRIC CO., LTD.
87	UNITED STATES OF AMERICA, ARMY
81	HITACHI, LTD.
71	GTE SYLVANIA INC.
71	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
70	ROCKWELL INTERNATIONAL CORP.
62	SIEMENS AG.
54	TEXAS INSTRUMENTS, INC.
50	UNITED STATES OF AMERICA, NASA
46	INTERNATIONAL STANDARD ELECTRIC CORP.
46	LICENTIA PATENT-VERWALTUNGS-GMBH
46	PIONEER ELECTRONIC CORP.
46	SANYO ELECTRIC CO., LTD.
44	WESTINGHOUSE ELECTRIC CORP.
39	COLLINS RADIO CO.
39	COMMUNICATIONS SATELLITE CORP.
39	MAGNAVOX CO.
36	TOKYO SHIBAURA ELECTRIC CO., LTD.
35	GENERAL MOTORS CORP.
35	HUGHES AIRCRAFT CO.
35	RAYTHEON CO.
35	UNITED STATES OF AMERICA, AIR FORCE
34	INTERNATIONAL BUSINESS MACHINES CORP.
33	NIPPON GAKKI SEIZO K.K.
33	THOMSON-CSF
32	HARRIS CORP.
31	SPERRY CORP.
28	BENDIX CORP.
26	ALPS ELECTRIC CO., LTD.
23	BLAUPUNKT-WERKE GMBH
23	VICTOR CO. OF JAPAN, LTD.
22	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
22	ELECTROHOME LTD.
20	COMMUNICATIONS PATENTS LTD.
20	TRIO K.K.
19	FORD AEROSPACE & COMMUNICATIONS CORP.
18	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
18	SANDERS ASSOCIATES INC.
17	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
16	GENERAL INSTRUMENT CORP.
16	OAK INDUSTRIES INC.
15	AVCO CORP.
15	GENERAL DYNAMICS CORP.
15	HOCHIKI CORP.
15	MASCO CORP. OF INDIANA
15	TRW INC.
14	CLARION CO., LTD.
14	E-SYSTEMS, INC.
14	KOKUSAI DENSHIN DENWA K.K.
14	OLYMPUS OPTICAL CO., LTD.

4.0 ANALOG CARRIER WAVE COMMUNICATIONS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2220	340	470	400	372	332	358	433	428	379	258	398	381	384	369	7522
U.S. ORIGIN	1824	263	356	314	281	232	249	284	282	233	167	203	211	217	224	5340
FOREIGN ORIGIN	396	77	114	86	91	100	109	149	146	146	91	195	170	167	145	2182
JAPAN	71	23	40	31	36	46	49	72	81	89	66	131	96	96	88	1015
WEST GERMANY	65	9	14	11	18	12	24	27	19	21	10	18	18	21	19	306
UNITED KINGDOM	86	7	20	11	4	11	14	16	15	6	3	13	17	11	10	244
FRANCE	56	12	14	10	14	6	5	4	7	5	2	5	12	13	11	176
NETHERLANDS	46	5	4	3	6	9	5	6	6	7	3	4	7	3	6	120
CANADA	31	10	10	9	2	4	6	1	3	9	3	5	8	7	4	112
ITALY	10	5	4	5	6	3		3	4	3	2	6	7	5	2	65
SWITZERLAND	10	1	1		2	1	1	1	1	5		6	1	4	1	35
SWEDEN	3	1		2	1	4	1	8	5			1	1	1	1	29
BELGIUM	2	1	2			1	2	2			1				1	12
AUSTRALIA	1		1				1	2	1					1	1	8
U.S.S.R.	1	2						1	1		1					7
DENMARK	2									1		2		1		6
HONG KONG					1			1				1	1	1		5
CZECHOSLOVAKIA	1			1				1	1							4
POLAND			1						1				1	1		4
AUSTRIA	2							1					1			4
ISRAEL	1					1			1					1		4
FINLAND				1								2				3
HUNGARY	1			1												2
CHINA(TAIWAN)												1			1	2
NORWAY		1				1										2
PERU	1							1								2
INDONESIA	2															2
SPAIN					1			1								2
ROMANIA	1		1													2
S. AFRICA			1													1
NICARAGUA	1															1
ECUADOR	1															1
CHINA P.REP.						1										1
SOUTH KOREA			1													1
BRAZIL							1									1
PORTUGAL				1												1
GUATEMALA	1															1
NEW ZEALAND								1								1
OTHER(0)																
U.S. ORIGIN	1824	263	356	314	281	232	249	284	282	233	167	203	211	217	224	5340
U.S. CORP. OWNED	1389	202	272	249	213	181	182	218	216	170	131	146	159	167	192	4087
U.S. GOVT. OWNED	177	22	37	26	35	18	26	33	21	18	6	18	12	9	10	468
U.S. INDIV. OWNED	255	37	46	38	33	33	40	29	43	44	30	38	38	39	21	764
FOREIGN OWNED	3	2	1	1			1	4	2	1		1	2	2	1	21
FOREIGN ORIGIN	396	77	114	86	91	100	109	149	146	146	91	195	170	167	145	2182
U.S. OWNED	104	25	26	10	15	17	24	20	18	14	8	20	12	13	12	338
FOREIGN OWNED	292	52	88	76	76	83	85	129	128	132	83	175	158	154	133	1844
FOREIGN CORP.	242	43	67	64	68	78	78	119	116	125	80	162	139	145	123	1649
FOREIGN GOVT.	5	1	2	1			1	1	2	1		1	2	1	2	20
FOREIGN INDIV.	45	8	19	11	8	5	6	9	10	6	3	12	17	8	8	175

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1973	348	298	299	321	364	409	416	403	408	374	405	237	31	1	6287
U.S. ORIGIN	1529	270	225	214	211	256	265	264	243	214	203	225	138	23	1	4281
FOREIGN ORIGIN	444	78	73	85	110	108	144	152	160	194	171	180	99	8		2006
JAPAN	124	24	27	48	46	49	72	97	107	119	112	105	56	6		992
WEST GERMANY	66	14	13	9	20	21	26	16	22	18	16	23	12	2		278
UNITED KINGDOM	64	9	7	9	12	11	17	10	5	16	15	12	7			194
FRANCE	63	11	11	3	8	3	5	5	4	7	8	17	8			153
NETHERLANDS	37	4	5	6	6	3	8	5	6	6	4	5	5			100
CANADA	38	7	2	1	8	4	2	5	7	7	5	7	5			98
ITALY	15	3	6	4		1	2	7	4	6	7	3	1			59
SWITZERLAND	6		1	2	1	1	1	3	2	7		4	1			29
SWEDEN	3	2	1	1	4	5	7		1	1		1	1			27
BELGIUM	5				3	2		1				1				12
AUSTRALIA	3					2		1				1	1			8
U.S.S.R.	3					1		1	1			1				7
DENMARK	1							1		3						5
HONG KONG		1				1			1	1	1					5
CZECHOSLOVAKIA	1	1				2										4
POLAND	1						1				2					4
AUSTRIA							1				1					2
ISRAEL				1			1						1			3
FINLAND		1								2						3
HUNGARY	1	1														2
CHINA(TAIWAN)										1			1			2
NORWAY	1			1												2
PERU	1					1										2
INDONESIA	2															2
SPAIN	1				1											2
ROMANIA	2															2
S. AFRICA	1															1
NICARAGUA	1															1
ECUADOR	1															1
CHINA P.REP.					1											1
SOUTH KOREA	1															1
BRAZIL						1										1
PORTUGAL	1															1
GUATEMALA	1															1
NEW ZEALAND							1									1
OTHER(0)																
U.S. ORIGIN	1529	270	225	214	211	256	265	264	243	214	203	225	138	23	1	4281
U.S. CORP. OWNED	1117	210	180	170	146	204	206	194	192	160	149	184	119	18	1	3250
U.S. GOVT. OWNED	191	26	17	19	23	19	24	15	11	11	12	7	8	1		384
U.S. INDIV. OWNED	216	33	28	25	41	28	35	51	40	43	40	33	11	3		627
FOREIGN OWNED	5	1			1	5		4			2	1		1		20
FOREIGN ORIGIN	444	78	73	85	110	108	144	152	160	194	171	180	99	8		2006
U.S. OWNED	108	13	8	11	27	20	18	12	16	22	9	15	11			290
FOREIGN OWNED	336	65	65	74	83	88	126	140	144	172	162	165	88	8		1716
FOREIGN CORP.	272	55	61	70	77	80	115	132	139	152	152	150	84	7		1546
FOREIGN GOVT.	6	2			2	1		1	1		1	4				18
FOREIGN INDIV.	58	8	4	4	4	7	11	7	4	20	9	11	4	1		152

4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

DEFINITION

This profile includes apparatus for generating and modulating a carrier wave such that a modulated carrier wave can be coupled to the transmission medium. Transmitters are presented as special purpose devices, employing specific circuits and modulation techniques or having a particular construction. Among the special purpose devices are mobile or portable transmitters that can be carried in vehicles or hand held by individuals. Specific circuits include those to control or change the frequency of the transmitter, control or measure signal quality and permit voice actuated operation. Different types of transmitters such as those using amplitude, frequency or other modulation techniques are also included.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 4.1 are:

U.S. Patent 4,274,156. This patent discloses a device for monitoring a radio frequency transmitter. The patent states that in case of a transmitter malfunction this device can switch off the transmitter in 25 microseconds, which is more than a thousand times faster than previous devices.

U.S. Patent 4,344,184. This patent discloses a wireless microphone, the type used by singers during stage performances. The inventor eliminated the projecting antenna by incorporating it into the unit's structure. This makes the microphone more compact and attractive.

U.S. Patent 4,373,206. This patent is an example of a mobile radio transmitter. It eliminates interference for other equipment in the system.

U.S. Patent 4,225,822. This patent is an example of an amplitude modulation circuit which is less expensive to use than previous circuits. It reduces the overmodulation and modulation distortion that may occur in a transmitter.

United States Patent [19]

Trefney

[11] **4,274,156**

[45] **Jun. 16, 1981**

[54] **MONITOR FOR RF TRANSMITTER**

[75] Inventor: **Ralph P. Trefney, Valley View, Ohio**

[73] Assignee: **Bird Electronic Corporation, Solon, Ohio**

[21] Appl. No.: **870,340**

[22] Filed: **Jan. 18, 1978**

[51] Int. Cl.³ **H04B 1/04; H04B 17/00**

[52] U.S. Cl. **455/115; 455/117**

[58] Field of Search 325/2, 151, 152, 31, 325/67, 133, 176, 187, 150; 343/17.7, 703, 894; 340/657, 660-663, 521, 517; 455/9, 67, 115, 117

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,854,663	9/1958	Maynard	325/133
3,020,529	2/1962	Turner	325/150
3,599,195	8/1971	Boyko	340/521
3,713,129	1/1973	Buchholz	340/517
3,717,863	2/1973	van Kempen et al.	340/521
3,870,957	3/1975	Straw	325/187
4,096,441	6/1978	Schwartz	325/67
4,142,238	2/1979	Brandt et al.	340/526

OTHER PUBLICATIONS

Noller Co. Bulletin No. 1007/SL970064, Issue 2; "Remote Control & Status Monitoring Systems-Centra--Line 430", Copy in A.V. 233 Search Room.

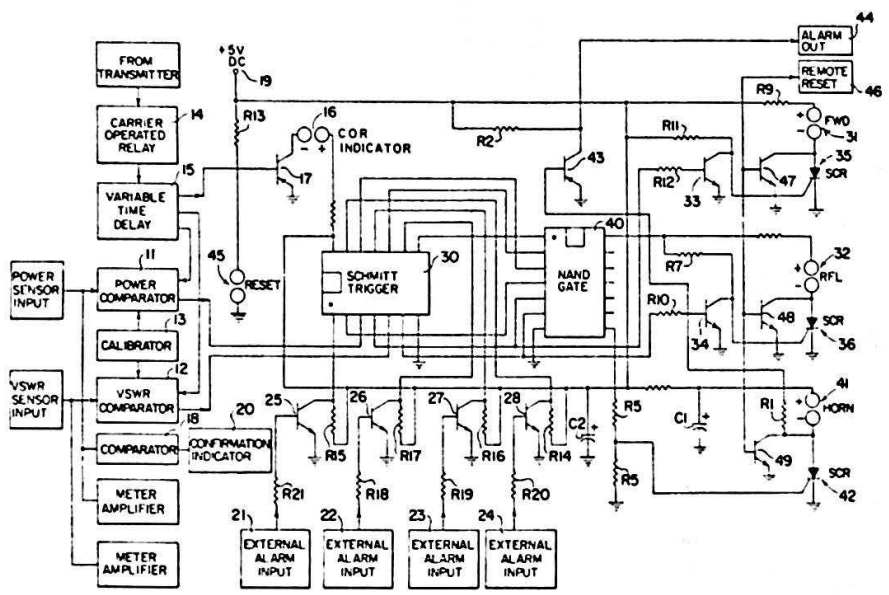
Primary Examiner—Marc E. Bookbinder

Attorney, Agent, or Firm—Pearne, Gordon, Sessions, McCoy & Granger

[57] **ABSTRACT**

A device for monitoring operating conditions of an RF transmitter, including the RF power output thereof, and the reflected voltage wave on a transmission line therefor, and for promptly switching the transmitter off whenever a faulty condition is detected. The device includes two voltage comparators that receive voltage signals representative of transmitter power output and the magnitude of the reflected voltage wave on an associated transmission line, and which generate an output signal whenever a respective voltage signal varies a predetermined amount from a preset reference voltage level. The two voltage comparators are activated by a relay operated by the carrier wave of the transmitter so that the comparators function only when the transmitter is operating. The output signals from the two comparators are transmitted together with any other signals indicating a faulty condition, to a NAND gate which outputs an alarm signal whenever at least one fault signal is received. The alarm signal is then processed to switch off the transmitter and, if desired, to simultaneously switch on an alternate backup transmitter. A third comparator associated with the amplifier circuit for the meter that indicates the transmitter power output is used to provide a transmitter-on condition indication once the transmitter reaches a power level of 2% of its output power after being switched on.

1 Claim, 5 Drawing Figures



United States Patent [19]

Edwards

[11] **4,344,184**

[45] **Aug. 10, 1982**

[54] **WIRELESS MICROPHONE**

[75] Inventor: **Robert R. Edwards, Los Alamitos, Calif**

[73] Assignee: **Cetec Corporation, El Monte, Calif.**

[21] Appl. No.: **174,153**

[22] Filed: **Jul. 31, 1980**

[51] Int. Cl.³ **H04B 1/034; H04B 1/04**

[52] U.S. Cl. 455/95; 343/702; 455/127; 455/128

[58] Field of Search 455/89, 90, 95, 100, 455/128, 129, 127; 343/702

[56] **References Cited**

U.S. PATENT DOCUMENTS

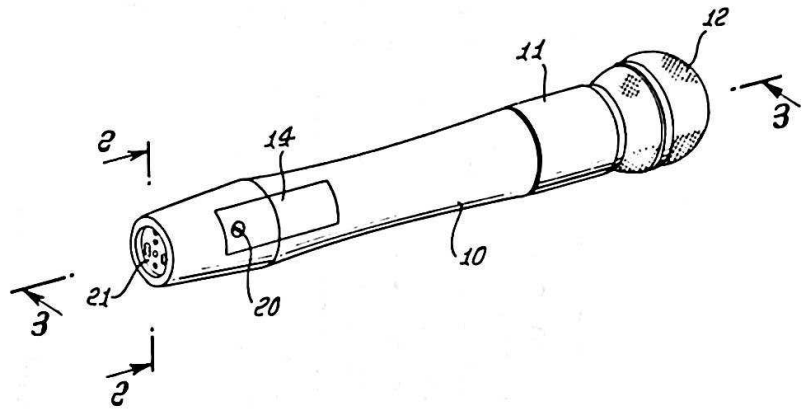
2,828,413	3/1958	Bowers	455/128
3,564,416	2/1971	Price	455/95

Primary Examiner—Marc E. Bookbinder

[57] **ABSTRACT**

A wireless microphone which does not require a separate antenna. A wireless microphone in the form of an elongate housing of nonelectrical conducting material with a microphone unit mounted in one end of the housing and a battery and control switch mounted in the other end of the housing. A first electrical circuit including an audio amplifier and a second electrical circuit including a radio frequency amplifier are mounted in the housing physically separated from each other and interconnected by radio frequency chokes. The output of the radio frequency amplifier is connected to circuit ground of the audio amplifier, with the microphone unit and first circuit serving as one radiator of a dipole and with the battery and second circuit serving as the other radiator of the dipole.

10 Claims, 4 Drawing Figures



United States Patent [19]
Suzuki et al.

[11] **4,373,206**
[45] **Feb. 8, 1983**

[54] **TRANSMITTER CONTROL SYSTEM**

[75] Inventors: **Yoshiharu Suzuki; Tomokazu Kai,** both of Toyko, Japan

[73] Assignee: **Nippon Electric Co., Inc., Tokyo,** Japan

[21] Appl. No.: **220,132**

[22] Filed: **Dec. 24, 1980**

[30] **Foreign Application Priority Data**

Dec. 28, 1979 [JP] Japan 54-170433

[51] Int. Cl.³ H04B 1/02; H04B 3/60

[52] U.S. Cl. 455/103; 455/116; 455/125, 455/126

[58] Field of Search ..... 455/103, 126, 115-117, 455/125, 127, 31-34, 53, 54, 56, 62, 68; 179/2 E, 2 EA, 2 EB, 2 EC; 340/311.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

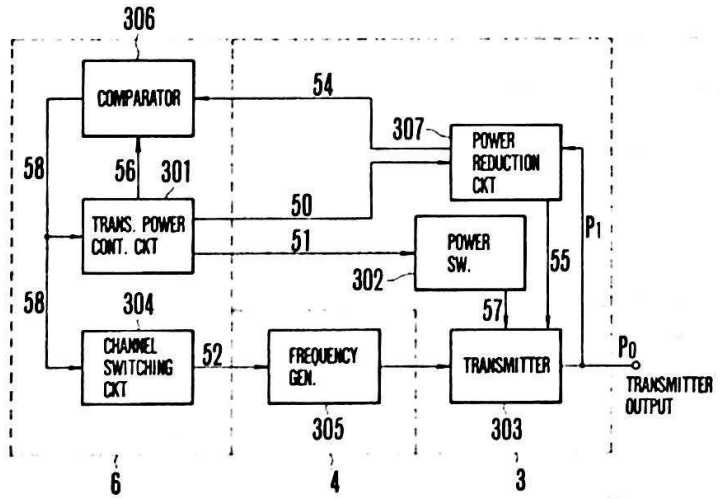
2,844,712	7/1958	Noizeux	455/116
3,456,202	7/1969	Miyagi	455/116
3,870,957	3/1975	Straw	455/115
4,025,855	5/1977	Atkinson	455/117
4,308,429	12/1981	Kai et al.	455/33

Primary Examiner—Marc E. Bookbinder
Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor & Zafman

[57] **ABSTRACT**

A transmitter control system for transmitters having means for selectively switching one channel to another in the multiple channels and means for controlling the transmitter output so as to deactivate, activate and reduce the transmitter output. The system comprises comparator means for comparing a start signal from the transmitter output control means with a detected signal of the transmitter output, the output of the comparator means being adapted to selectively drive at least one of the channel switching means for switching channels and a transmitter power reduction control circuit included in the transmitter output control means upon occurrence of a detected signal of the transmitter output indicative of a failure of the transmitter.

5 Claims, 10 Drawing Figures



United States Patent [19]
Kariatsumari

[11] **4,225,822**
[45] **Sep. 30, 1980**

[54] **AMPLITUDE MODULATION CIRCUIT FOR A TRANSMITTER**

[75] Inventor: **Kelichiro Kariatsumari, Inagi, Japan**

[73] Assignee: **Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan**

[21] Appl. No.: **886,661**

[22] Filed: **Mar. 14, 1978**

[30] **Foreign Application Priority Data**

Mar. 24, 1977 [JP] Japan 52-31582

[51] Int. Cl.² H04B 1/04; H03C 1/06

[52] U.S. Cl. ..... 455/108; 179/1 F; 179/1 VL; 332/38; 455/91

[58] Field of Search ..... 332/37 D, 38; 325/150, 325/159, 182, 187; 179/1 VL, 1 F

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,734,219	11/1929	Lorance	179/1 VL
2,255,683	9/1941	Singer	330/123
2,312,260	2/1943	Miller	179/1 VL
3,292,116	12/1966	Walker et al.	325/187
3,398,381	8/1968	Torick et al.	325/187
3,571,529	3/1971	Gharib et al.	179/1 F

FOREIGN PATENT DOCUMENTS

46-9859 4/1971 Japan .

OTHER PUBLICATIONS

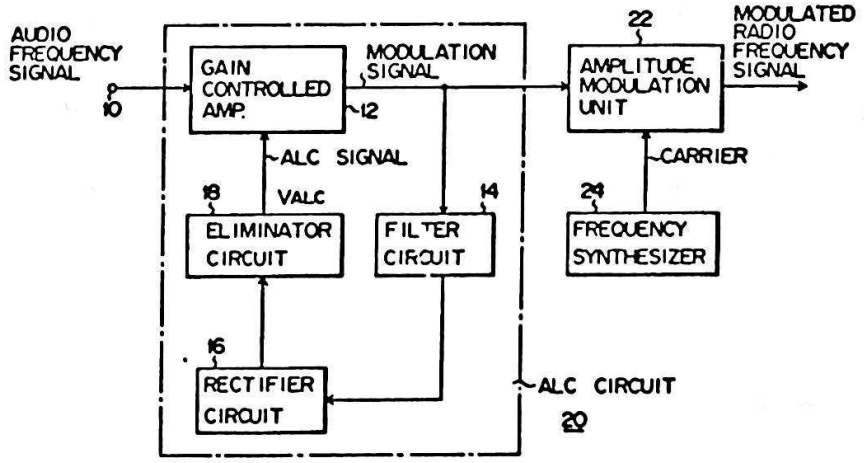
"Installation & Operating Instructions of AM citizen's Band Transceiver"—Browning Laboratories, Inc. P. 10.

Primary Examiner—Marc E. Bookbinder
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

An amplitude modulation circuit for a transmitter has an automatic level controlled circuit (ALC circuit), including in its negative feedback loop a series circuit of a high-pass filter, a rectifier circuit and an eliminator circuit, for modulation degree suppression, thereby avoiding overmodulation. The high-pass filter is so designed that the negative feedback signal level for modulation degree suppression of the ALC circuit is raised as the audio-signal frequency supplied to the transmitter increases. In the modulation circuit having such ALC circuit, a sufficiently high mean modulation degree may be obtained without encountering overmodulation if the main spectrum components of the input audio-frequency signal are distributed in the intermediate range of the audio-signal frequency band. On the other hand, if the main spectrum components of the audio-frequency signal are distributed in the higher (high-pass) range, the upper limit of the modulation degree is restricted to a moderately lower value so as to reduce production of spurious signals. Here the ALC circuit operates so as not to change the frequency characteristic of the audio-frequency input signal but to suppress the modulation degree uniformly throughout the frequency band of the audio-frequency input signal. Therefore, the modulation circuit does not cause variation in a tone quality of the input signal.

7 Claims, 31 Drawing Figures



4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

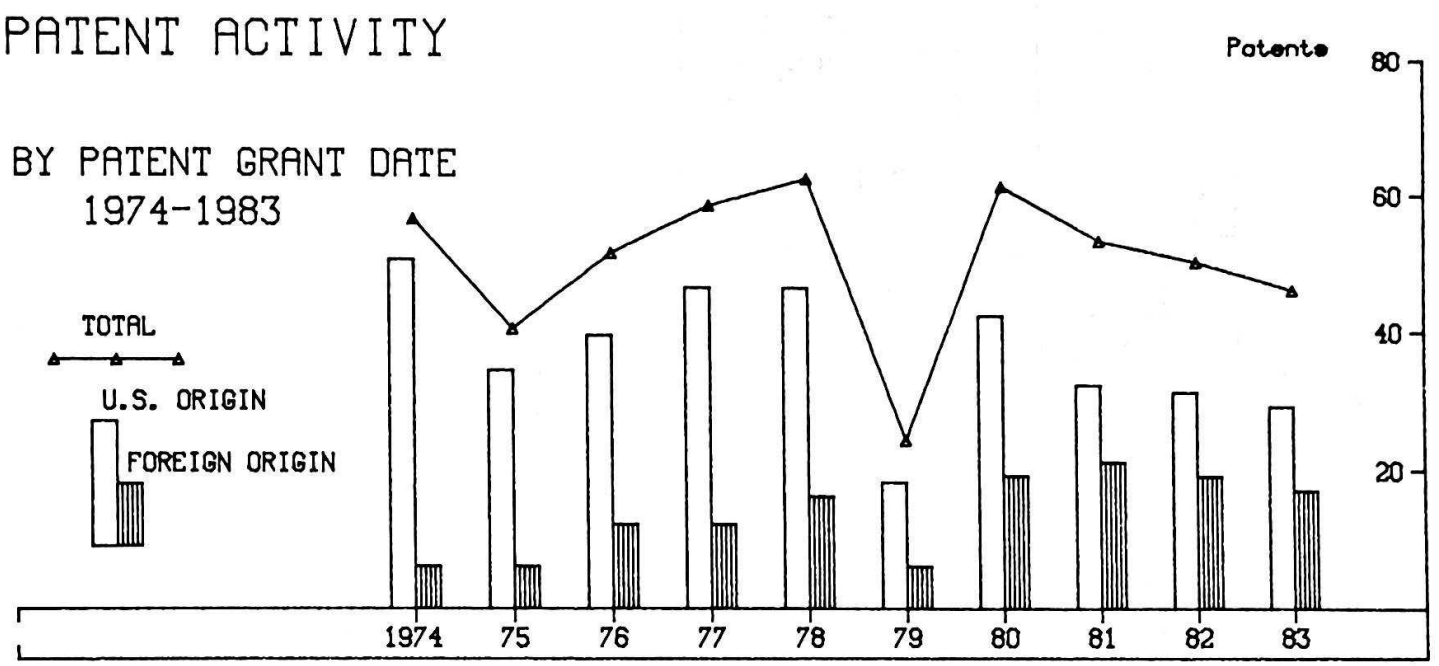
ACTIVITY SUMMARY

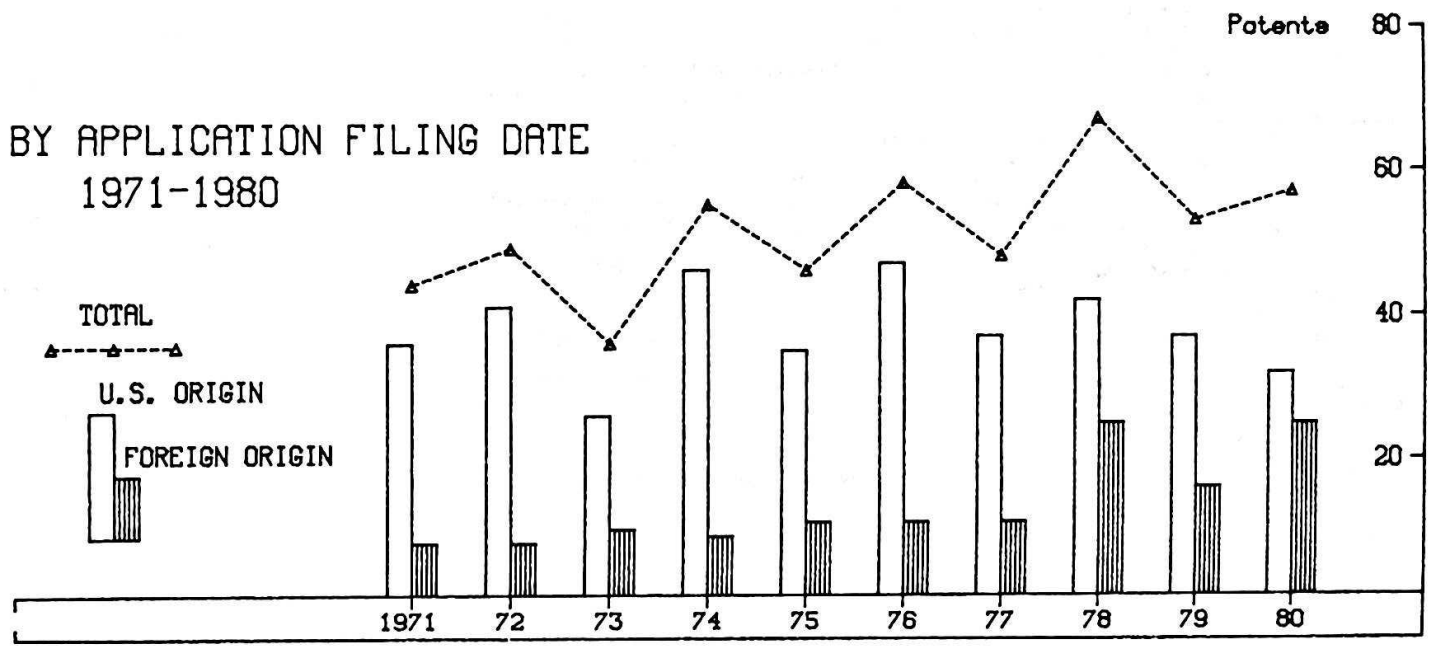
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	29.7%
FOREIGN SHARE	38.3%
CORPORATE OWNED	74.5%
GOVERNMENT OWNED	6.0%
U.S. OWNED OF FOREIGN	3.5%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 455, Subclasses 91-129





4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

ORGANIZATIONS ASSIGNED 3 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
55	MOTOROLA INC.
35	RCA CORP.
26	UNITED STATES OF AMERICA, NAVY
22	UNITED STATES OF AMERICA, ARMY
16	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
15	COLLINS RADIO CO.
15	BELL TELEPHONE LABORATORIES, INC.
15	GENERAL ELECTRIC CO.
11	AVCO CORP.
10	SPERRY CORP.
10	ROCKWELL INTERNATIONAL CORP.
8	GTE SYLVANIA INC.
8	INTERNATIONAL STANDARD ELECTRIC CORP.
8	NIPPON ELECTRIC CO., LTD.
8	SIEMENS AG.
8	U.S. PHILIPS CORP.
7	GATES RADIO CO.
7	HUGHES AIRCRAFT CO.
7	THOMSON-CSF
7	WESTINGHOUSE ELECTRIC CORP.
6	TEXAS INSTRUMENTS, INC.
6	HARRIS CORP.
5	GENERAL DYNAMICS CORP.
5	MARCONI CO., LTD.
5	SOLID STATE TECHNOLOGY INC.
5	UNITED STATES OF AMERICA, AIR FORCE
5	UNITED STATES OF AMERICA, NASA
4	HEWLETT-PACKARD CO.
4	HITACHI, LTD.
4	LICENTIA PATENT-VERWALTUNGS-GMBH
4	S. ELECTRIC CO.
4	TOKYO SHIBAURA ELECTRIC CO., LTD.
3	BENDIX CORP.
3	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
3	ECKRICH, PETER & SONS, INC.
3	GTE LABORATORIES INC.
3	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
3	MINNESOTA MINING AND MANUFACTURING CO.
3	NATIONAL RESEARCH DEVELOPMENT CORP.
3	NISSAN MOTOR CO., LTD.
3	PATELHOLD PATENTVERWERTUNGS- & ELEKTRO-HOLDING AG.
3	RAYTHEON CO.
3	WILCOX ELECTRIC CO., INC.

4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	465	57	82	77	54	56	40	51	58	62	24	61	53	50	46	1236
U.S. ORIGIN	378	47	63	63	42	50	34	39	46	46	18	42	32	31	29	960
FOREIGN ORIGIN	87	10	19	14	12	6	6	12	12	16	6	19	21	19	17	276
JAPAN	11	2	3	3	3		2	2	4	9	2	5	2	9	8	65
UNITED KINGDOM	29	1	5	2	2		1	3	4		1	4	7		3	62
WEST GERMANY	14	2	1	1	4	1			1	3		4	2	3	2	38
FRANCE	8	4	2	4		2		2		1			2	2	2	29
CANADA	3	1	3	2		1	1	1	2	1	2	2	3		1	23
NETHERLANDS	15		1							2	1		1			20
ITALY	1		1	1	1								3		1	8
SWITZERLAND	1				1							2	1	3		8
SWEDEN	2				1			1								4
DENMARK	2													1		3
ISRAEL	1					1			1							3
BELGIUM							2							1		2
AUSTRALIA								1								2
FINLAND												2				2
SOUTH KOREA			1													1
ROMANIA			1													1
NORWAY						1										1
POLAND			1													1
PORTUGAL				1												1
CZECHOSLOVAKIA								1								1
HONG KONG								1								1
U.S. ORIGIN	378	47	63	63	42	50	34	39	46	46	18	42	32	31	29	960
U.S. CORP. OWNED	269	31	44	43	27	39	27	23	31	30	13	30	19	22	20	668
U.S. GOVT. OWNED	40	6	5	7	6	4	3	4	4	4		1	4	1	3	92
U.S. INDIV. OWNED	69	10	14	12	9	7	4	12	10	12	5	11	9	7	6	197
FOREIGN OWNED				1					1					1		3
FOREIGN ORIGIN	87	10	19	14	12	6	6	12	12	16	6	19	21	19	17	276
U.S. OWNED	25	1	5	1	2	1	2	1	2	3	3	2	1	1		50
FOREIGN OWNED	62	9	14	13	10	5	4	11	10	13	3	17	20	18	17	226
FOREIGN CORP.	52	7	7	11	10	5	3	8	9	11	2	14	15	18	14	186
FOREIGN GOVT.	1								1				1			3
FOREIGN INDIV.	9	2	7	2			1	3		2	1	3	4		3	37

4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	378	63	44	49	36	55	46	58	48	67	53	57	25	4		983
U.S. ORIGIN	304	52	36	41	26	46	35	47	37	42	37	32	16	2		753
FOREIGN ORIGIN	74	11	8	8	10	9	11	11	11	25	16	25	9	2		230
JAPAN	14	3	1	2	1	1	5	7	5	4	3	11	4	1		62
UNITED KINGDOM	18	1	2	1	2	2	3	1	1	4	6	3	1			45
WEST GERMANY	13	2	2	2				1	2	5	2	2	1	1		33
FRANCE	9	3			3	1	1		1		1	2	2			23
CANADA	6	1	1		2	1	1	1	1	4	2	2				22
NETHERLANDS	6							1	1	1	1					10
ITALY	1	1	1							1	1	1	1			7
SWITZERLAND	1			1						3		3				8
SWEDEN	1		1			1										3
DENMARK	1									1						2
ISRAEL				1			1									2
BELGIUM					2											2
AUSTRALIA						1						1				2
FINLAND										2						2
SOUTH KOREA	1															1
ROMANIA	1															1
NORWAY				1												1
POLAND	1															1
PORTUGAL	1															1
CZECHOSLOVAKIA						1										1
HONG KONG						1										1
U.S. ORIGIN	304	52	36	41	26	46	35	47	37	42	37	32	16	2		753
U.S. CORP. OWNED	207	35	26	31	17	31	22	30	27	29	23	23	12	2		515
U.S. GOVT. OWNED	36	5	3	4	3	4	5	3	1		5	1	2			72
U.S. INDIV. OWNED	61	11	7	6	6	10	8	14	9	13	8	8	2			163
FOREIGN OWNED		1				1					1					3
FOREIGN ORIGIN	74	11	8	8	10	9	11	11	11	25	16	25	9	2		230
U.S. OWNED	14	1		3	2	1	1	2	3	4	1	1				33
FOREIGN OWNED	60	10	8	5	8	8	10	9	8	21	15	24	9	2		197
FOREIGN CORP.	45	9	8	5	7	5	9	9	6	17	13	21	8	1		163
FOREIGN GOVT.	1				1							1				3
FOREIGN INDIV.	14	1				3	1		2	4	2	2	1	1		31

4.1 ANALOG CARRIER WAVE COMMUNICATIONS: TRANSMITTER CIRCUITS AND SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	445
TOTAL REFERENCES CITED	2493
U.S. Patent References Cited	2245
Foreign Patent References Cited	111
Other References Cited	137

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	1434
Japan	99
United Kingdom	73
West Germany	43
France	31

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,641,451, Motorola Inc.	12
3,870,954, International Telephone & Telegraph Corp.	8
3,852,669, United States of America, Army	8
4,019,150, Motorola Inc.	7
3,486,128, United States of America, Army	7

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Motorola Inc.	85
United States of America, Navy	40
Bell Telephone Laboratories, Inc.	40
RCA Corp.	38
United States of America, Army	36

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

DEFINITION

This profile includes circuits for the recovery and reproduction of the information signal placed on a carrier signal. Individual areas are defined by the specific function a circuit performs. These include circuits that remove the signal from the carrier, permit selection of a particular station or channel, change the frequency of the modulated carrier to another frequency (such as the intermediate frequency), and provide local oscillator frequency control. Circuits that provide control of the signal level or volume and correct for or eliminate noise or distortion are also included.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 4.2 are:

U.S. Patent 4,327,446. This patent is an example of a noise elimination circuit for use in radio receivers.

U.S. Patent 4,374,437. This patent describes a television tuning system that uses a microcomputer to provide rapid tuning of a selected channel.

U.S. Patent 4,314,375. This patent is an example of the electronic systems developed to provide for television channel selection.

U.S. Patent 4,340,975. This patent describes a tuner arrangement that permits the selection of either VHF or UHF signals without having to switch between two separate tuners.

United States Patent [19]

Dressler

[11] **4,327,446**

[45] **Apr. 27, 1982**

[54] **NOISE BLANKER WHICH TRACKS AVERAGE NOISE LEVEL**

[75] Inventor: **Roger W. Dressler, Palatine, Ill.**

[73] Assignee: **Motorola, Inc., Schaumburg, Ill.**

[21] Appl. No.: **177,341**

[22] Filed: **Aug. 12, 1980**

Related U.S. Application Data

[63] Continuation of Ser. No. 32,625, Apr. 23, 1979, abandoned.

[51] **Int. Cl.**³ **H04B 1/10**

[52] **U.S. Cl.** **455/223**

[58] **Field of Search** 455/212, 219, 222-224

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,098,872	7/1963	Howard .	
3,188,571	6/1965	Michael	455/222
3,191,124	6/1965	Brown	455/224
3,588,705	6/1971	Paine .	
3,623,144	11/1971	Fischel .	
3,699,457	10/1972	Wright	455/224
3,739,285	6/1973	Hepp .	
4,006,419	2/1977	Liman .	
4,189,679	4/1981	Amazawa et al. .	

FOREIGN PATENT DOCUMENTS

2633000	1/1978	Fed. Rep. of Germany
2370391	11/1977	France .

OTHER PUBLICATIONS

"A Simple Noise Blanker", Electronics Australia, vol. 38, No. 11, Feb. 1977.

1979 Sanyo Paris Catalog of Sanyo Part. No. LA 2101, Printed Nov. 1978.

1978 Sanyo Catalog Listing for Integrated Circuit LA 2100.

"Stereo-Autoempfanger mit eingebautem Kassettenteil", Funkschau, 8/19/76, pp. 42-45 by Riethergen.

"Impulsive Noise Reduction In Radio Receivers", by Gosling, 5/73, pp. 341-347.

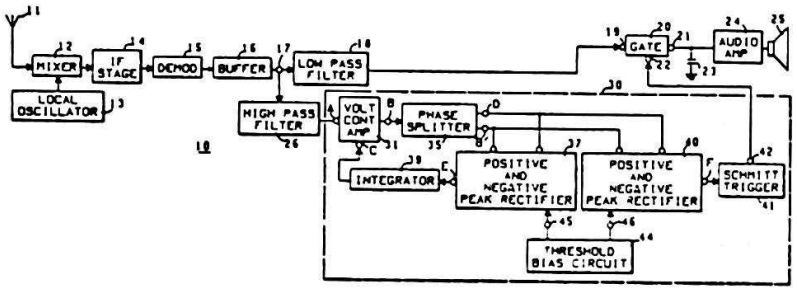
Primary Examiner—Jin F. Ng

Attorney, Agent, or Firm—James W. Gillman; Phillip H. Melamed

[57] **ABSTRACT**

A noise blanker which has circuitry that enables the threshold level of noise blanking to track the average background noise level is disclosed. In general, a controllable gate receives an input signal and selectively passes and blocks the input signal in response to received noise blanking pulses which are generated in response to high peak magnitude noise impulses. A signal related to background and impulse noise is extracted from an input signal. A controllable gain noise amplifier is utilized to amplify the separated background and impulse noise and negative feedback circuitry is utilized to maintain the average peak output of the noise amplifier substantially constant except for occasional large magnitude noise impulses which do not substantially change the average peak magnitude of the background and impulse noise. The output of the controllable noise amplifier is applied to a threshold switch means which produces blanking pulses in response to the amplified noise signal having a peak exceeding a magnitude which is greater than the substantially constant peak output level of the noise amplifier. This results in a blanker circuit in which the threshold level of blanking pulses closely tracks the average peak value of the background and impulse noise.

12 Claims, 4 Drawing Figures



United States Patent [19]

Citta et al.

[11] **4,374,437**

[45] **Feb. 15, 1983**

[54] **VARIABLE RAMP SPEED TV TUNING SYSTEM FOR RAPID CHANNEL TUNING**

[75] Inventors: **Richard W. Citta, Portland, Oreg.; Scott L. Falater, Melbourne, Fla.**

[73] Assignee: **Zenith Radio Corporation, Glenview, Ill.**

[21] Appl. No.: **220,619**

[22] Filed: **Dec. 29, 1980**

[51] **Int. Cl.**³ **H04B 1/16**; H04N 5/50; H03J 7/06

[52] **U.S. Cl.** **455/164**; 455/182; 455/184; 455/186; 358/193.1; 358/195.1

[58] **Field of Search** 455/164, 169, 182, 184-186; 358/193.1, 195.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

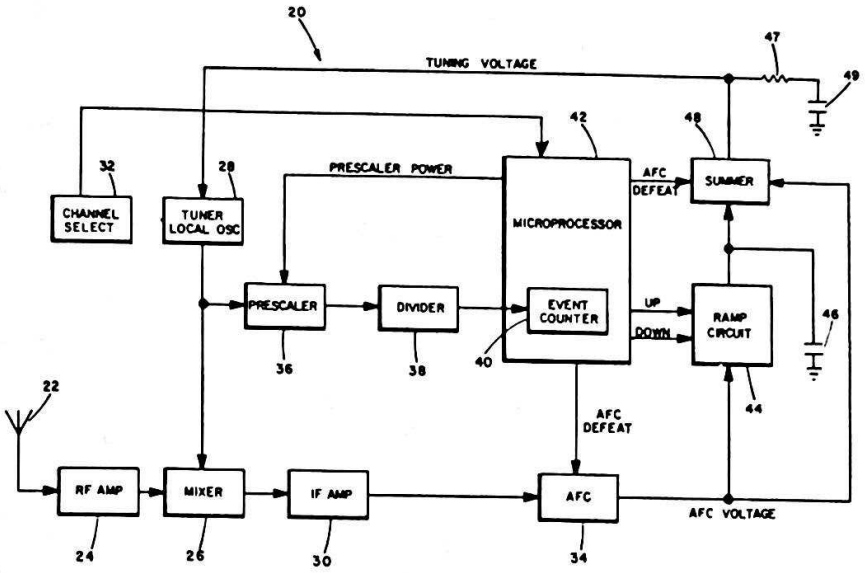
3,943,449	3/1976	Hendrickson et al.	455/186
4,070,629	1/1978	Merrell .	
4,105,948	8/1978	Wolkstein .	
4,114,100	9/1978	Klank .	
4,156,197	5/1979	Merrell .	
4,254,506	3/1981	Henderson et al.	455/186
4,291,413	9/1981	Henderson et al.	455/185

Primary Examiner—Jin F. Ng

[57] **ABSTRACT**

Disclosed is a microcomputer-controlled frequency synthesis television tuning system utilizing variable tuning ramp speeds following channel selection. Channel tuning is expedited by means of three ramping speeds employed during the tuning process. The system initially ramps quickly toward the selected channel and then automatically and incrementally reduces tuning speed as the proper frequency is approached. Once the proper frequency has been reached, the variable ramp speed signal acquisition mode is terminated and an AFC mode is initiated. Large frequency changes are thus made possible over short periods to accomodate widely separated channels efficiently.

5 Claims, 9 Drawing Figures



United States Patent [19]

Belisomi

[11] **4,314,375**

[45] **Feb. 2, 1982**

[54] **TELEVISION TUNING SYSTEM**

[75] Inventor: **Pietro Belisomi**, Pinerolo, Italy

[73] Assignee: **Italiana S.p.A. Indesit Industria Elettromdomestici**, Italy

[21] Appl. No.: **40,079**

[22] Filed: **May 17, 1979**

[30] **Foreign Application Priority Data**

May 22, 1978 [IT] Italy 68162 A/78

[51] **Int. Cl.**³ **H03J 7/18; H04N 5/50**

[52] **U.S. Cl.** **455/158; 455/160; 455/165; 455/186; 358/192.1**

[58] **Field of Search** 455/158, 160, 164, 165, 455/183, 185, 186; 358/192.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,984,828	10/1976	Beyers Jr.	455/158
4,020,484	4/1977	Caspari	358/192.1
4,081,797	3/1978	Olson	358/192.1
4,088,958	5/1978	Suzuki et al.	455/158
4,122,395	10/1978	Schotz et al.	455/158
4,156,850	5/1979	Beyers Jr.	455/186

OTHER PUBLICATIONS

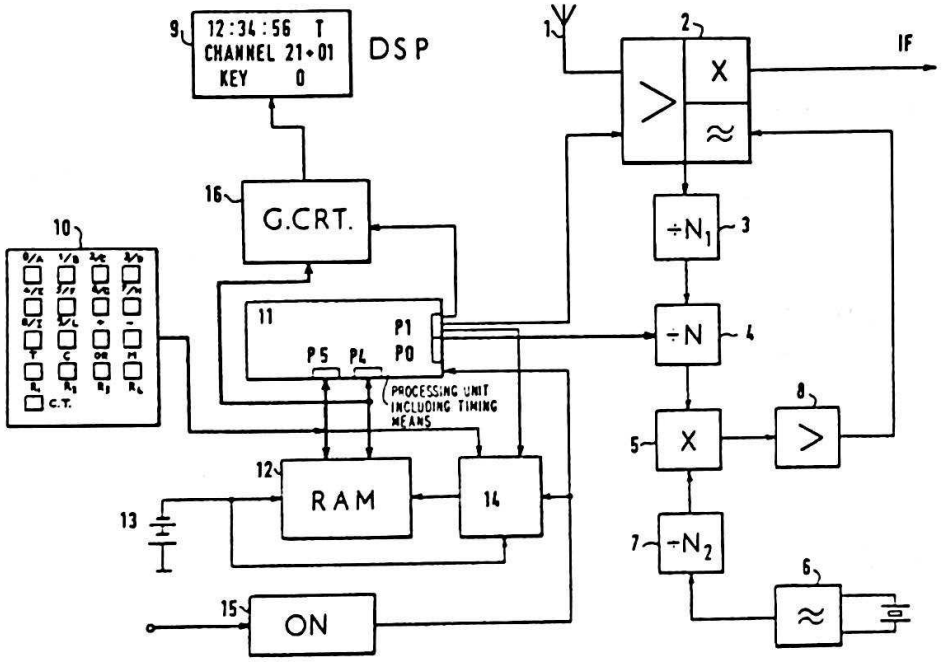
"A Microcomputer Controlled Freq. Synthesizer for TV" by Rzeszewski et al. pp. 145–154, 2/1978.
"Funkschau" vol. 49, No. 17, 8/1977.
"Farbfernsehgerät mit Mikroprozzssor-Steuzrung" by Baum, pp. 763–768, 1977.

Primary Examiner—Jin F. Ng
Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen

[57] **ABSTRACT**

The present invention relates to a television tuning system comprising a frequency synthesizer, which includes a variable frequency divider and which enables the television set to be selectively tuned to different television channels, and an arrangement operable to generate and display on the television picture display a combination of alpha-numeric characters containing information concerning the channel selection.

23 Claims, 7 Drawing Figures



United States Patent [19]

Onishi et al.

[11] **4,340,975**

[45] **Jul. 20, 1982**

[54] **MICROWAVE MIXING CIRCUIT AND A VHF-UHF TUNER HAVING THE MIXING CIRCUIT**

[75] Inventors: **Hiroshi Onishi**, Kawasaki; **Sadahiko Yamashita**, Sagamihara, both of Japan

[73] Assignee: **Matsushita Electric Industrial Company, Limited**, Osaka, Japan

[21] Appl. No.: **195,314**

[22] Filed: **Oct. 8, 1980**

[30] **Foreign Application Priority Data**

Oct. 9, 1979 [JP] Japan 54-130573
Apr. 14, 1980 [JP] Japan 55-49377

[51] **Int. Cl.**³ **H03D 7/02; H03D 7/14; H04B 1/26; H04N 5/44**

[52] **U.S. Cl.** **455/315; 358/191.1; 455/327; 455/330; 455/331**

[58] **Field of Search** 455/315, 316, 318, 319, 455/320, 323, 325, 326, 327, 330, 331; 358/191.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

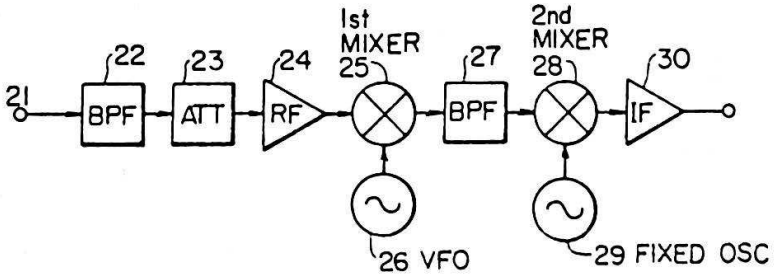
3,801,915	4/1974	Ostuni	455/316
3,823,380	7/1974	Young	455/325
3,939,429	2/1976	Lohn	455/315
4,061,990	12/1977	Ueno	455/325
4,152,669	5/1979	Igarashi	455/316
4,249,263	2/1981	Shinkawa	455/330

Primary Examiner—Howard Britton
Attorney, Agent, or Firm—Lowe, King, Price & Becker

[57] **ABSTRACT**

In a double superheterodyne tuner for receiving TV channel signals, a frequency in a range defined between 2520 and 2700 MHz is selected as the first intermediate frequency, while the first intermediate frequency is obtained by subtracting a desired channel frequency from a first local oscillator frequency. The tuner comprises first and second mixing circuits respectively used for effecting frequency conversion, where each of these mixing circuits has parallel coupled lines so that each mixing circuit operates as a balance-to-unbalance transformer. The second mixing circuit further comprises a short-circuit line placed between the parallel coupled lines. The tuner also comprises a band pass filter having a band width less than 5 MHz, which selectively transmits the first intermediate frequency signal from the first mixing circuit.

29 Claims, 21 Drawing Figures



4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

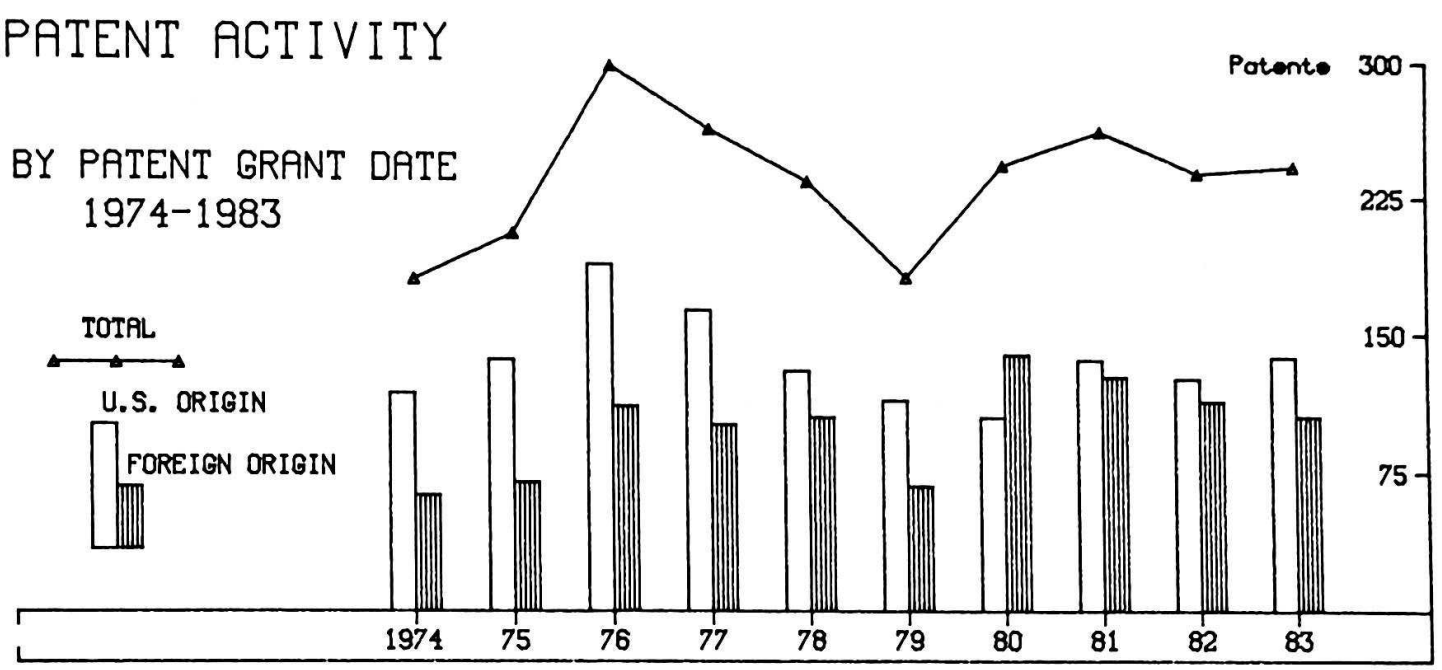
ACTIVITY SUMMARY

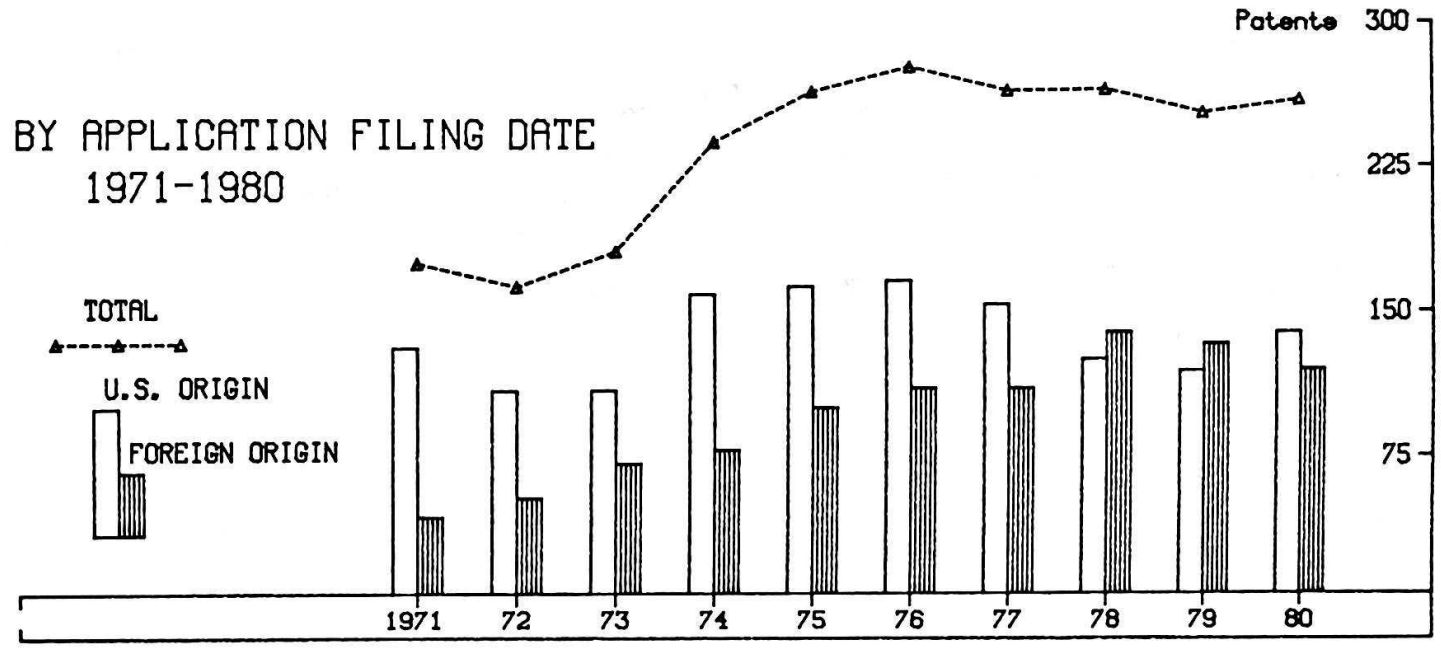
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	31.7%
FOREIGN SHARE	46.4%
CORPORATE OWNED	87.4%
GOVERNMENT OWNED	2.0%
U.S. OWNED OF FOREIGN	7.9%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 455, Subclasses 130-355





4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

ORGANIZATIONS ASSIGNED 10 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
229	MOTOROLA INC.
202	RCA CORP.
129	SONY CORP.
115	ZENITH RADIO CORP.
112	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
87	GENERAL ELECTRIC CO.
78	BELL TELEPHONE LABORATORIES, INC.
78	U.S. PHILIPS CORP.
75	UNITED STATES OF AMERICA, NAVY
71	HITACHI, LTD.
56	NIPPON ELECTRIC CO., LTD.
53	GTE SYLVANIA INC.
49	ROCKWELL INTERNATIONAL CORP.
45	TEXAS INSTRUMENTS, INC.
42	SANYO ELECTRIC CO., LTD.
41	UNITED STATES OF AMERICA, ARMY
35	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
35	LICENTIA PATENT-VERWALTUNGS-GMBH
35	PIONEER ELECTRONIC CORP.
33	NIPPON GAKKI SEIZO K.K.
33	SIEMENS AG.
32	GENERAL MOTORS CORP.
31	MAGNAVOX CO.
25	ALPS ELECTRIC CO., LTD.
25	INTERNATIONAL STANDARD ELECTRIC CORP.
22	BLAUPUNKT-WERKE GMBH
22	COLLINS RADIO CO.
22	ELECTROHOME LTD.
22	TOKYO SHIBAURA ELECTRIC CO., LTD.
20	TRIO K.K.
19	UNITED STATES OF AMERICA, NASA
18	BENDIX CORP.
18	FORD AEROSPACE & COMMUNICATIONS CORP.
18	UNITED STATES OF AMERICA, AIR FORCE
17	VICTOR CO. OF JAPAN, LTD.
17	WESTINGHOUSE ELECTRIC CORP.
16	GENERAL INSTRUMENT CORP.
16	HARRIS CORP.
16	THOMSON-CSF
15	RAYTHEON CO.
15	SANDERS ASSOCIATES INC.
14	HUGHES AIRCRAFT CO.
14	MASCO CORP. OF INDIANA
14	OLYMPUS OPTICAL CO., LTD.
14	SPERRY CORP.
13	ADMIRAL CORP.
13	CLARION CO., LTD.
13	FUJITSU TEN LTD.
13	SARKES TARZIAN INC.
13	THOMAS INTERNATIONAL CORP.
12	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
12	INDESIT INDUSTRIA ELETTRODOMESTICI ITALIANA S.P.A.
11	TRW INC.
10	COMMUNICATIONS SATELLITE CORP.
10	INTERNATIONAL BUSINESS MACHINES CORP.
10	OAK INDUSTRIES INC.

4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1213	187	280	217	207	179	204	297	262	233	180	242	261	238	242	4442
U.S. ORIGIN	1020	140	223	175	155	117	135	187	162	129	113	104	135	125	137	3057
FOREIGN ORIGIN	193	47	57	42	52	62	69	110	100	104	67	138	126	113	105	1385
JAPAN	39	14	27	14	23	37	37	63	67	69	51	106	83	78	72	780
WEST GERMANY	34	8	11	8	13	9	19	24	12	16	9	10	12	13	14	212
UNITED KINGDOM	33	3	7	5	3	3	5	8	5	3		4	6	4	3	92
FRANCE	26	7	5	3	4	3	2		4	1	1	2	6	5	7	76
CANADA	23	8	5	6	1	2	3		2	4	1	3	4	2	1	65
NETHERLANDS	17	2	1	2	5	4	2	5	3	4	2	2	7	2	5	63
ITALY	4	3	1	1		2		1	2	3	2	4	5	5	1	34
SWITZERLAND	5	1			1		1		1	3		4		1	1	18
U.S.S.R.	1	1						1	1		1			1		6
SWEDEN						1		2	2				1			6
DENMARK	2									1		1		1		5
BELGIUM	1					1		2								4
AUSTRIA	2												1			3
POLAND									1				1	1		3
AUSTRALIA	1							1								2
SPAIN					1			1								2
CZECHOSLOVAKIA	1			1												2
INDONESIA	2															2
CHINA(TAIWAN)												1			1	2
HONG KONG					1							1				2
NEW ZEALAND								1								1
ROMANIA	1															1
FINLAND				1												1
HUNGARY				1												1
PERU								1								1
BULGARIA	1															1
U.S. ORIGIN	1020	140	223	175	155	117	135	187	162	129	113	104	135	125	137	3057
U.S. CORP. OWNED	805	120	181	148	124	91	99	149	122	99	92	79	107	98	117	2431
U.S. GOVT. OWNED	89	5	19	13	14	7	14	22	14	10	3	8	4	4	6	232
U.S. INDIV. OWNED	125	14	22	14	17	19	21	13	25	20	18	17	24	23	13	385
FOREIGN OWNED	1	1	1				1	3	1						1	9
FOREIGN ORIGIN	193	47	57	42	52	62	69	110	100	104	67	138	126	113	105	1385
U.S. OWNED	49	16	11	6	9	8	16	16	10	8	4	15	9	8	10	195
FOREIGN OWNED	144	31	46	36	43	54	53	94	90	96	63	123	117	105	95	1190
FOREIGN CORP.	121	27	38	30	37	49	51	88	83	91	60	115	108	101	89	1088
FOREIGN GOVT.	1	1	1	1					1			1			1	7
FOREIGN INDIV.	22	3	7	5	6	5	2	6	6	5	3	7	9	4	5	95

4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1065	192	174	162	180	236	262	275	263	264	252	259	159	25		3768
U.S. ORIGIN	844	149	131	109	109	158	162	165	153	125	119	139	86	19		2468
FOREIGN ORIGIN	221	43	43	53	71	78	100	110	110	139	133	120	73	6		1300
JAPAN	69	13	20	37	37	42	60	77	78	100	99	82	49	4		767
WEST GERMANY	39	11	10	6	16	18	19	12	18	10	10	17	8	2		196
UNITED KINGDOM	24	3	4	2	5	5	8	3	1	6	5	2	4			72
FRANCE	32	3	5	1	2	2	1	2		4	3	9	5			69
CANADA	26	5		1	5	1	1	4	2	4	2	2	1			54
NETHERLANDS	14	3	4	3	2	2	6	3	4	3	4	4	4			56
ITALY	5	1		2		1		6	3	4	7	2				31
SWITZERLAND	2			1	1		1	1	2	4		1	1			14
U.S.S.R.	2					1		1	1			1				6
SWEDEN					1	2	2			1						6
DENMARK	1							1		2						4
BELGIUM	1				1	2										4
AUSTRIA											1					1
POLAND							1				2					3
AUSTRALIA	1					1										2
SPAIN	1				1											2
CZECHOSLOVAKIA	1	1														2
INDONESIA	2															2
CHINA(TAIWAN)										1			1			2
HONG KONG		1							1							1
NEW ZEALAND							1									1
ROMANIA	1															1
FINLAND		1														1
HUNGARY		1														1
PERU						1										1
BULGARIA																
U.S. ORIGIN	844	149	131	109	109	158	162	165	153	125	119	139	86	19		2468
U.S. CORP. OWNED	660	122	112	85	77	127	130	123	123	96	92	117	75	14		1953
U.S. GOVT. OWNED	85	11	6	11	10	14	17	9	8	6	5	3	5	1		191
U.S. INDIV. OWNED	96	16	13	13	21	14	15	32	22	23	22	19	6	3		315
FOREIGN OWNED	3				1	3		1						1		9
FOREIGN ORIGIN	221	43	43	53	71	78	100	110	110	139	133	120	73	6		1300
U.S. OWNED	52	8	6	4	16	15	11	8	10	15	6	11	9			171
FOREIGN OWNED	169	35	37	49	55	63	89	102	100	124	127	109	64	6		1129
FOREIGN CORP.	142	29	34	45	51	60	82	96	96	112	121	103	61	6		1038
FOREIGN GOVT.	3	1			1			1				1				7
FOREIGN INDIV.	24	5	3	4	3	3	7	5	4	12	6	5	3			84

4.2 ANALOG CARRIER WAVE COMMUNICATIONS: RECEIVER OR FREQUENCY CONVERTOR CIRCUITS AND SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	2159
TOTAL REFERENCES CITED	12255
U.S. Patent References Cited	11058
Foreign Patent References Cited	474
Other References Cited	723

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	6539
Japan	1400
West Germany	418
United Kingdom	205
France	161

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,845,394, Sony Corp.	37
3,968,440, Texas Instruments, Inc.	32
3,961,261, Tennelec, Inc.	30
3,835,384, General Dynamics Corp.	27
3,940,702, Alps Electric Co., Ltd.	25

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Motorola Inc.	479
RCA Corp.	416
Matsushita Electric Industrial Co., Ltd.	310
Zenith Radio Corp.	308
Sony Corp.	260

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

DEFINITION

This profile includes systems designed to perform a special function and complete stations or systems having circuits for performing specific functions. Complete stations are transceivers, i.e., transmitters and receivers at the same location, and complete systems are those with transmitters and receivers at separate locations.

Among the special systems are those which distribute signals to several locations, repeaters, and systems to prevent unauthorized reception of the transmitted signal. Also included are systems that permit selective communication between individual transmitters, such as cellular systems.

Some of the complete systems contain specific circuits that control or measure signal quality or utilize various modulation techniques. The transceivers may have circuits for signal quality control, or have circuits peculiar to transceivers. Examples of the latter are circuits which prevent transmitter-receiver switching or interaction and those which use common elements to perform plural functions.

Circuit structure specific to a transmitter or receiver found in one of the transmitter or receiver profiles may also be found here if it is employed as part of a transmitter and/or receiver in a complete station or system.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 4.3 are:

U.S. Patent 4,392,242. This patent describes a circuit arrangement for use in cellular mobile communication systems. The patent states that this invention provides many more speech channels than previously known systems.

U.S. Patent 4,259,741. This patent describes a satellite relay system which has sharp directivity and efficiently uses the available frequency bands.

U.S. Patent 4,377,870. This patent describes a portable system for polling people in an audience. This device is wireless and designed to be used easily in a variety of locations.

U.S. Patent 4,317,222. This patent describes a radio transceiver with a hand-held microphone in which the controls and displays are on the microphone instead of on the main chassis of the transceiver.

United States Patent [19]

Kai

[11] **4,392,242**

[45] **Jul. 5, 1983**

[54] **MOBILE COMMUNICATION SYSTEM**

[75] Inventor: **Tomokazu Kai**, Tokyo, Japan

[73] Assignee: **Nippon Electric Co., Ltd.**, Tokyo, Japan

[21] Appl. No.: **240,937**

[22] Filed: **Mar. 5, 1981**

[30] **Foreign Application Priority Data**

Mar. 10, 1980 [JP] Japan 55-30127

[51] Int. Cl.³ **H04B 1/00**

[52] U.S. Cl. **455/33**; 455/34; 455/56; 455/62; 340/825.44

[58] Field of Search ..... 455/31-34, 455/54, 56, 62, 89, 77, 76; 179/2 EB; 340/825.44

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,663,762	5/1972	Joel, Jr.	
3,913,017	10/1975	Imaseki	455/33
3,983,492	9/1976	Fisher et al.	455/62
4,127,744	11/1978	Yoshikawa et al.	455/54
4,144,412	3/1979	Ito et al.	455/33
4,308,429	12/1981	Kai et al.	455/33

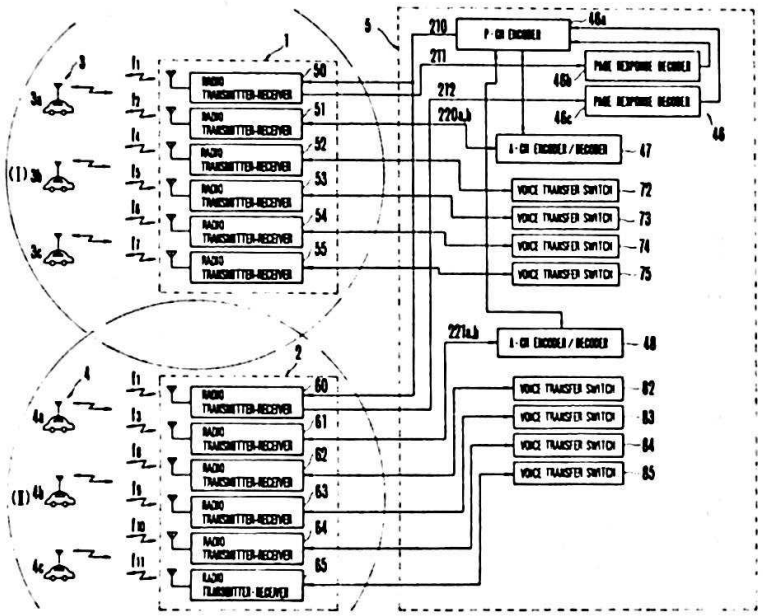
Primary Examiner—Jin F. Ng

Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor & Zafman

[57] **ABSTRACT**

There is provided a mobile transmission system wherein a plurality of radio zones, each including one radio base station, the base stations of all radio zones being controlled by a control center which controls a paging and an origination of a mobile, are arranged to form a service area, and each radio zone is provided with at least one mobile access channel and a single mobile paging channel assigned with radio frequency common to all radio zones, thus establishing speech channels for the mobiles. The frequency of the mobile access channel is made to be different for adjacent radio zones and one or more frequencies are allocated to each base station. The control center is provided with a system for controlling an origination signal of the mobile for selecting at least one channel among available channels allocated to a radio base station associated with the mobile, circuit switching system operatively connected to the origination control system, for establishing the mobile access channel, and a system for broadcasting a channel number of the established mobile access channel to all radio zones through the mobile paging channel. Each mobile is provided with a receiver for receiving the channel number of the mobile access channel, means for updating and storing the received channel number, and a system for sequentially receiving radio waves transmitted through the stored access channel and for comparing received field intensities from the radio zones with each other to select a mobile access channel adapted to send out an origination signal of the mobile.

3 Claims, 14 Drawing Figures



United States Patent [19]

Kawai

[11] **4,259,741**

[45] **Mar. 31, 1981**

[54] **SATELLITE RELAY SYSTEM**

[75] Inventor: **Makoto Kawai**, Yokohama, Japan

[73] Assignee: **Nippon Telegraph and Telephone Public Corp.**, Tokyo, Japan

[21] Appl. No.: **17,254**

[22] Filed: **Mar. 5, 1979**

[30] **Foreign Application Priority Data**

Mar. 3, 1978 [JP] Japan 53/23586

[51] Int. Cl.³ **H04B 7/185**

[52] U.S. Cl. 455/12; 370/75

[58] Field of Search ..... 343/100 ST, 100 SA, 343/854; 325/4, 14; 179/15 A, 15 AD, 15 AL, 15 BS; 178/69.1; 455/12, 13; 370/75

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,864,679	2/1975	Hannan et al.	343/100 SA
3,922,680	11/1975	Alsberg et al.	343/100 SA
3,928,804	12/1975	Schmidt et al.	343/100 ST
4,090,199	5/1978	Archer	343/100 SA
4,105,973	8/1978	Arnold et al.	179/15 BS
4,122,453	10/1978	Profera	343/100 SA

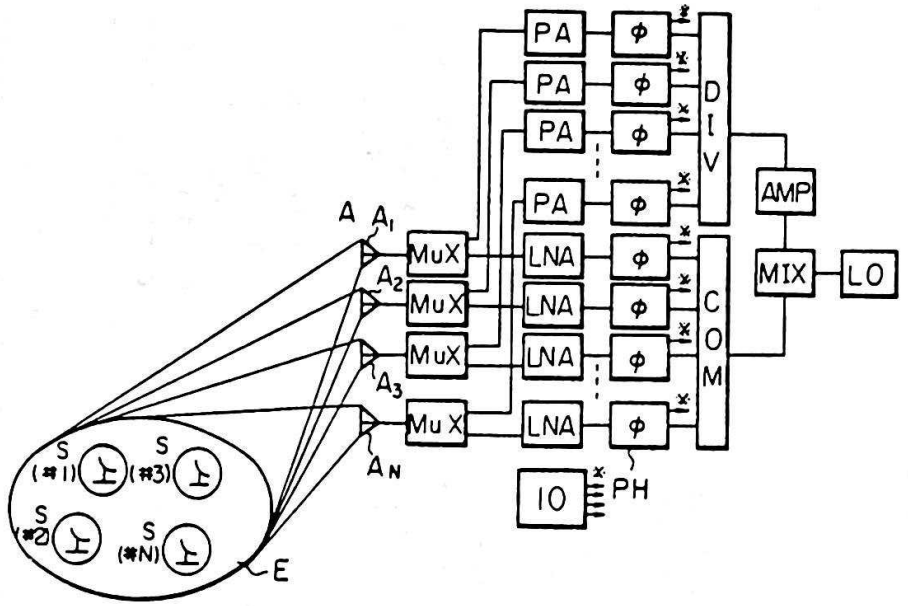
Primary Examiner—Benedict V. Safourek

Attorney, Agent, or Firm—Armstrong, Nikaido, Marmelstein & Kubovcik

[57] **ABSTRACT**

A satellite relay system for Time Division Multiple Access (TDMA) utilizing a beam scanning technique has been found. According to the present invention a plurality of antennas each relating to the corresponding earth station have a narrow spot beam with sharp directivity. Each of the up-link bursts (a signal from an earth station to a satellite) is simply combined, and a single-channel TDMA signal is obtained. Said TDMA signal is then divided into a plurality of signals by a power divider after frequency conversion. Each of said signals is processed by a variable phase shifter, the output of which is applied to a power amplifier. A 2n-port directional coupler having n number of input terminals and n number of output terminals is provided and each of said input terminals is connected to the output of the corresponding power amplifier. Each of the output signals of the 2n-port directional coupler provides a down-link burst and is connected to the corresponding transmission antenna which has a sharp directivity covering only a single specific earth station. The 2n-port directional coupler is composed of a plurality of couplers or hybrid circuits.

7 Claims, 17 Drawing Figures



United States Patent [19]
Anderson et al.

[11] 4,377,870
[45] * Mar. 22, 1983

[54] ELECTRONIC AUDIENCE POLLING SYSTEM

[75] Inventors: Roy E. Anderson, Scotia; Richard L. Frey, Schenectady; James R. Lewis, Albany, all of N.Y.

[73] Assignee: General Electric Company, Schenectady, N.Y.

[*] Notice: The portion of the term of this patent subsequent to Sep. 15, 1982, has been disclaimed.

[21] Appl. No.: 971,703

[22] Filed: Dec. 21, 1978

[51] Int. Cl.³ H04B 17/00; H04J 3/14

[52] U.S. Cl. ..... 455/2; 179/2 AS; 235/386; 340/504; 358/84

[58] Field of Search ..... 325/31, 309, 308, 44, 325/51, 64, 66, 67; 340/171 A, 502, 182, 504; 35/9 A-9 F, 48 R, 48 B; 179/2 AS; 235/51, 52, 54 F, 56, 386; 455/2, 3, 4, 5, 6, 67, 53; 358/84, 185

[56] References Cited

U.S. PATENT DOCUMENTS

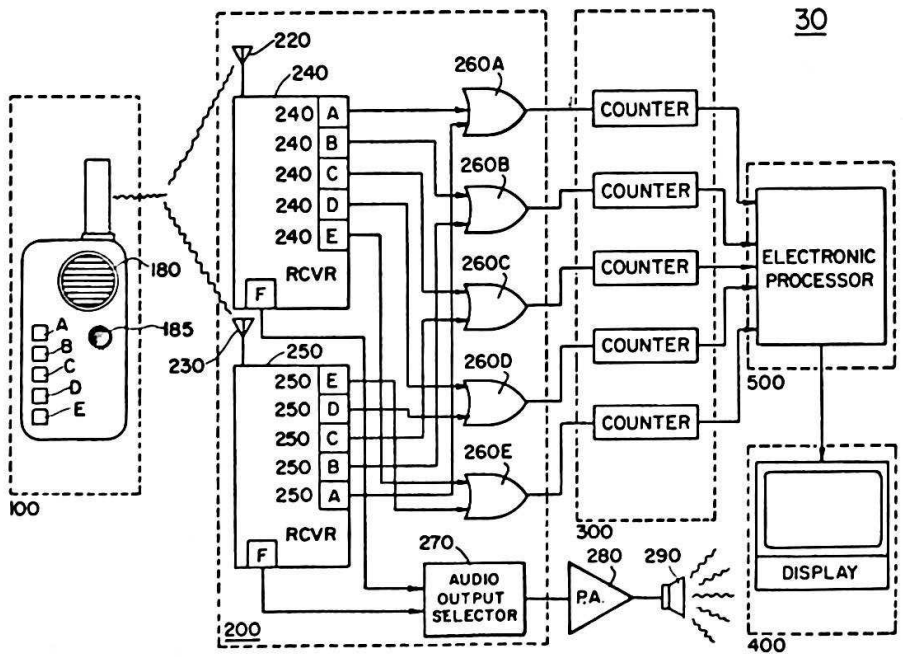
2,427,670	9/1947	Goldsmith	325/31
3,144,647	8/1964	Sichak	325/154
3,299,355	1/1967	Jenks	325/31
3,318,517	5/1967	Wells	455/2
3,500,559	3/1970	Jones	35/48
3,947,669	3/1976	Simmons	325/51
4,149,144	4/1979	Diefenderfer	340/147 R
4,151,370	4/1979	Root	179/2 AS
4,290,141	9/1981	Anderson et al.	455/2

Primary Examiner—Tommy P. Chin
Attorney, Agent, or Firm—Geoffrey H. Krauss; James C. Davis, Jr.; Marvin Snyder

[57] ABSTRACT

An audience polling system includes a plurality of wireless transmitters, each transmitter capable of transmitting a pulse of electromagnetic energy on a selected one of a group of predetermined frequencies. Each frequency selected on which to transmit corresponds to one of a group of suggested responses to a given stimulus. The polling system includes a receiver for receiving the transmitted pulses and electronic counters for tallying the number of pulses received on each of the selected frequencies. An electronic display presents the results of the tallying for observation by the audience or others.

28 Claims, 6 Drawing Figures



United States Patent [19]
Bell et al.

[11] 4,317,222
[45] Feb. 23, 1982

[54] TRANSCEIVER/RECEIVER INFORMATION MULTIPLEXING SYSTEM

[75] Inventors: Robert R. Bell, Libertyville, Ill.; Scott T. Christians, Seguin, Tex.

[73] Assignee: Motorola, Inc., Schaumburg, Ill.

[21] Appl. No.: 108,433

[22] Filed: Dec. 31, 1979

[51] Int. Cl.³ H04B 1/40

[52] U.S. Cl. 455/77; 455/151; 455/355

[58] Field of Search 455/73, 77, 78, 88, 455/151, 352-355

[56] References Cited

U.S. PATENT DOCUMENTS

4,110,690	8/1978	Kakigi	455/77
4,147,984	4/1979	Caudel et al.	455/77
4,153,877	5/1979	Fathauer et al.	455/77
4,197,498	4/1980	Fukui et al.	455/77

FOREIGN PATENT DOCUMENTS

2754696	6/1978	Fed. Rep. of Germany	455/77

Primary Examiner—Jin F. Ng
Attorney, Agent, or Firm—Phillip H. Melamed; James W. Gillman

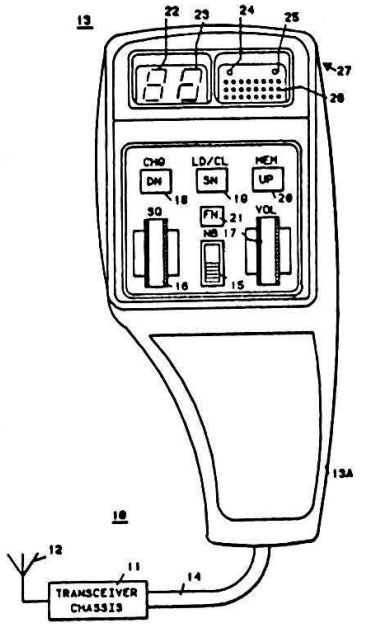
[57] ABSTRACT

A radio transceiver is disclosed having manual controls on a microphone and the remainder of the circuitry located in a main chassis. The microphone and chassis are connected by means of a multiconductor cable, and time sharing multiplexing techniques are utilized and serially transmit information, bidirectionally, along a common data line while a clock line is utilized to synchronize the operation of main chassis and microphone circuitry. Multiple bit binary coded digital words are sent to the microphone to activate microphone displays while analog signals are sent from the microphone to the main chassis to provide analog control signals for the transceiver.

A digital synchronizing pulse detector is disclosed for use in the above transceiver multiplexing system. The detector identifies synchronizing pulses which occur in the clock signal wherein the identification insures the synchronization of microphone and main chassis circuitry.

The transceiver provides for designating a subset of all of the available communication channels as desired channels, and in a memory mode the transceiver is tuned only to those desired channels. Distinctive visual displays are produced indicating if any channels have been designated as desired channels, and if all possible storage space for storing desired channel identification has been utilized. In addition, the dual use of a few pushbuttons is disclosed such that the sequence in which these pushbuttons are actuated determines the transceiver mode of operation selected.

14 Claims, 9 Drawing Figures



4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

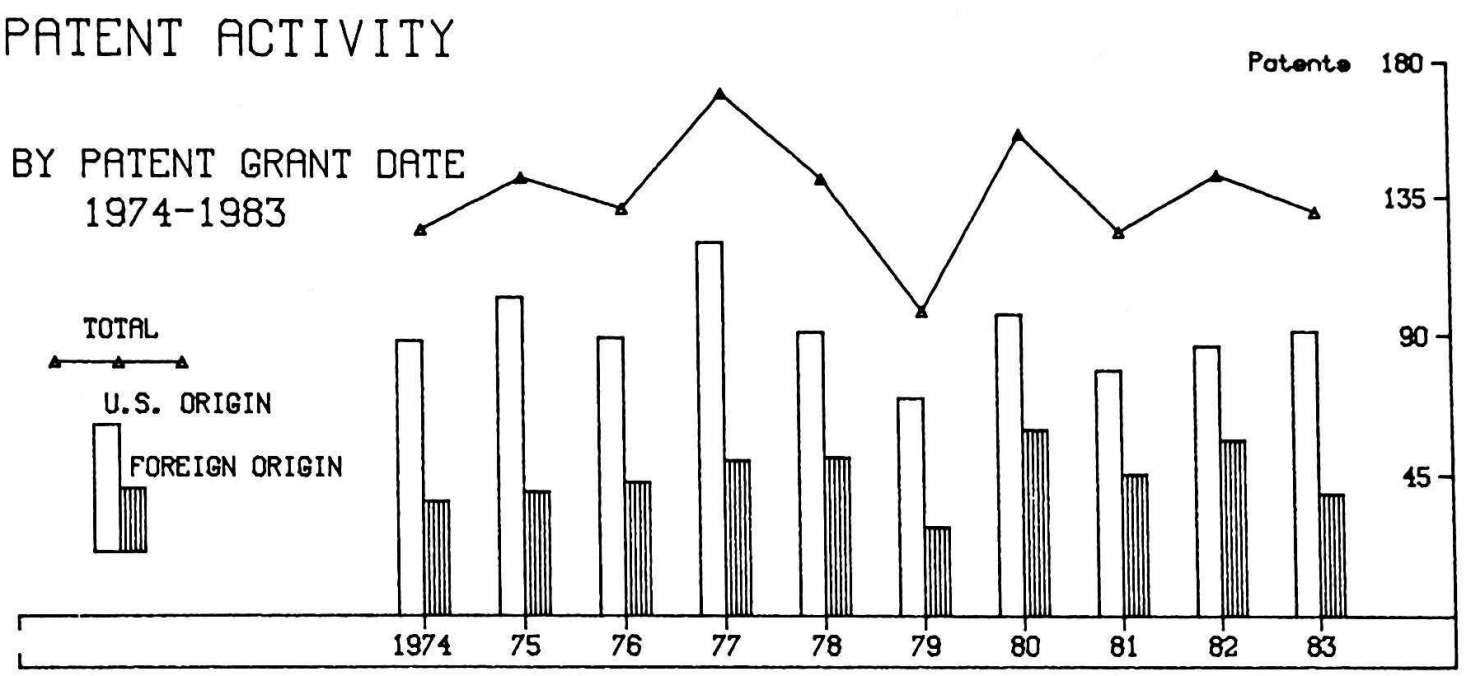
ACTIVITY SUMMARY

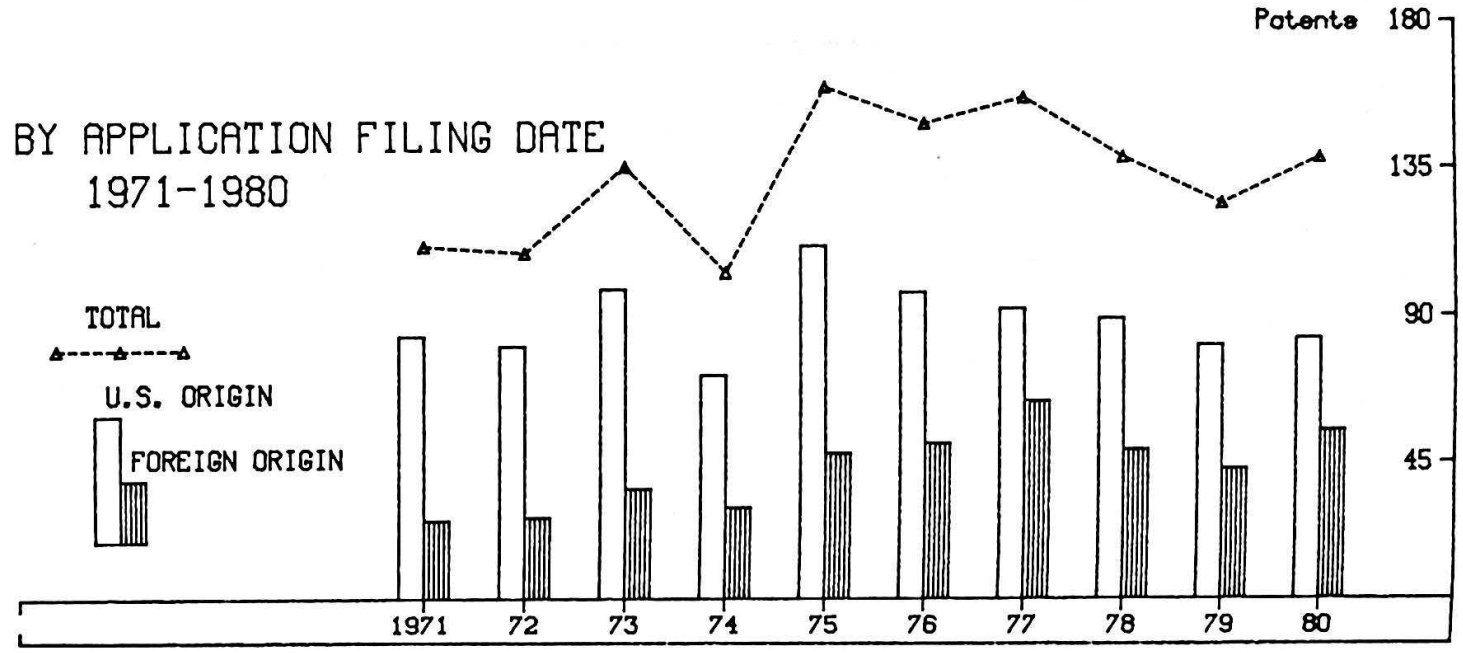
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	29.3%
FOREIGN SHARE	35.4%
CORPORATE OWNED	80.0%
GOVERNMENT OWNED	5.1%
U.S. OWNED OF FOREIGN	7.1%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 455, Subclasses 1-90





4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

ORGANIZATIONS ASSIGNED 5 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
120	MOTOROLA INC.
97	BELL TELEPHONE LABORATORIES, INC.
50	UNITED STATES OF AMERICA, NAVY
48	NIPPON ELECTRIC CO., LTD.
43	U.S. PHILIPS CORP.
41	GENERAL ELECTRIC CO.
37	RCA CORP.
32	UNITED STATES OF AMERICA, ARMY
29	COMMUNICATIONS SATELLITE CORP.
28	UNITED STATES OF AMERICA, NASA
27	SIEMENS AG.
26	INTERNATIONAL BUSINESS MACHINES CORP.
25	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
23	WESTINGHOUSE ELECTRIC CORP.
20	COMMUNICATIONS PATENTS LTD.
19	RAYTHEON CO.
17	HUGHES AIRCRAFT CO.
17	INTERNATIONAL STANDARD ELECTRIC CORP.
17	UNITED STATES OF AMERICA, AIR FORCE
15	GTE SYLVANIA INC.
15	HOCHIKI CORP.
15	ROCKWELL INTERNATIONAL CORP.
14	SPERRY CORP.
14	THOMSON-CSF
13	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
12	HARRIS CORP.
12	KOKUSAI DENSHIN DENWA K.K.
12	PIONEER ELECTRONIC CORP.
11	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
11	TELEFONAKTIEBOLAGET LM ERICSSON
11	TEXAS INSTRUMENTS, INC.
10	BENDIX CORP.
10	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
10	LICENTIA PATENT-VERWALTUNGS-GMBH
10	MAGNAVOX CO.
10	TOKYO SHIBAURA ELECTRIC CO., LTD.
9	HITACHI, LTD.
9	JERROLD ELECTRONICS CORP.
9	OAK INDUSTRIES INC.
8	CYBERNET ELECTRONIC CORP.
8	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
8	SUMITOMO ELECTRIC INDUSTRIES, LTD.
7	SONY CORP.
7	UNITED TECHNOLOGIES CORP.
6	FUJITSU LTD.
6	GENERAL AVIATION ELECTRONICS, INC.
6	MARTIN-MARIETTA CORP.
6	VICTOR CO. OF JAPAN, LTD.
5	BELL & HOWELL CO.
5	COAL INDUSTRY (PATENTS) LTD.
5	COLLINS RADIO CO.
5	COLUMBIA PICTURES INDUSTRIES, INC.
5	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
5	NISSAN DENSHI K.K.
5	NISSAN MOTOR CO., LTD.
5	TECHNICAL COMMUNICATIONS CORP.
5	TOCOM, INC.
5	ZENITH RADIO CORP.

4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	775	126	157	156	151	123	140	130	168	140	97	155	123	142	130	2713
U.S. ORIGIN	623	95	111	117	114	87	101	88	119	90	69	96	78	86	91	1965
FOREIGN ORIGIN	152	31	46	39	37	36	39	42	49	50	28	59	45	56	39	748
JAPAN	30	10	14	15	11	11	12	14	17	25	20	33	16	21	18	267
UNITED KINGDOM	32	3	10	5	2	8	9	8	7	3	3	8	9	7	4	118
FRANCE	27	4	9	6	11	1	3	2	3	3	1	3	6	7	5	91
WEST GERMANY	21	2	2	4	3	2	5	4	9	7	1	5	6	9	5	85
NETHERLANDS	21	3	2	1	2	5	3	1	4	3	1	2	2	1	1	52
CANADA	5	2	2	2	1	1	4		2	6	1	1	4	6	2	39
ITALY	5	3	2	3	5	1		2	2			2	1		1	27
SWEDEN	1	1		2		4	1	7	3			1		1	1	22
SWITZERLAND	4		1		2	1		1		3						12
BELGIUM	1	1	2			1					1				1	7
AUSTRALIA			1				1		1						1	4
DENMARK												2		1		3
U.S.S.R.		1												1		2
HONG KONG													1	1		2
CZECHOSLOVAKIA								1	1							2
S. AFRICA			1									1				1
ECUADOR	1							1								1
FINLAND																1
SPAIN	1															1
GUATEMALA	1															1
PERU				1												1
PORTUGAL		1														1
NORWAY												1				1
CHINA(TAIWAN)							1									1
BRAZIL	1															1
NICARAGUA	1															1
HUNGARY														1		1
ISRAEL								1								1
AUSTRIA						1										1
CHINA P.REP.																
U.S. ORIGIN	623	95	111	117	114	87	101	88	119	90	69	96	78	86	91	1965
U.S. CORP. OWNED	452	66	74	93	80	64	72	68	89	58	46	66	54	60	77	1419
U.S. GOVT. OWNED	67	11	17	7	17	8	10	11	5	5	4	11	5	5	5	188
U.S. INDIV. OWNED	102	17	20	17	17	15	19	8	24	26	19	18	17	20	9	348
FOREIGN OWNED	2	1						1	1	1		1	2	1		10
FOREIGN ORIGIN	152	31	46	39	37	36	39	42	49	50	28	59	45	56	39	748
U.S. OWNED	39	11	13	4	5	8	6	3	6	6	3	8	4	4	2	122
FOREIGN OWNED	113	20	33	35	32	28	33	39	43	44	25	51	41	52	37	626
FOREIGN CORP.	88	16	25	28	30	27	29	35	37	40	25	46	32	46	35	539
FOREIGN GOVT.	4	1	1				1	1		1			2	1	1	13
FOREIGN INDIV.	21	3	7	7	2	1	3	3	6	3		5	7	5	1	74

4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	746	124	111	109	135	103	159	148	156	138	124	138	81	6	1	2279
U.S. ORIGIN	554	93	84	81	98	72	111	97	92	89	81	83	52	4	1	1592
FOREIGN ORIGIN	192	31	27	28	37	31	48	51	64	49	43	55	29	2		687
JAPAN	54	9	6	11	10	11	15	26	40	21	18	24	11	1		257
UNITED KINGDOM	28	5	5	6	6	6	8	6	4	9	8	8	2			101
FRANCE	32	6	7	2	3		3	3	4	3	4	9	3			79
WEST GERMANY	22	4	1	1	4	3	9	6	6	5	5	7	4	1		78
NETHERLANDS	19	2	1	3	4	1	3	2	3	2	2	1	1			44
CANADA	7	2	1		3	2	2	2	5	2	4	3	4			37
ITALY	10	1	5	2			2	1	1	1	1		1			25
SWEDEN	2	2		1	4	4	5		1			1	1			21
SWITZERLAND	3		1	2		1		3								10
BELGIUM	4				1			1				1				7
AUSTRALIA	2							1					1			4
DENMARK										3						3
U.S.S.R.	1											1				2
HONG KONG										1	1					2
CZECHOSLOVAKIA						2										2
S. AFRICA	1															1
ECUADOR	1															1
FINLAND										1						1
SPAIN					1											1
GUATEMALA	1															1
PERU	1															1
PORTUGAL	1															1
NORWAY	1															1
CHINA(TAIWAN)										1						1
BRAZIL						1										1
NICARAGUA	1															1
HUNGARY	1															1
ISRAEL													1			1
AUSTRIA							1									1
CHINA P.REP.					1											1
U.S. ORIGIN	554	93	84	81	98	72	111	97	92	89	81	83	52	4	1	1592
U.S. CORP. OWNED	376	72	60	63	66	62	86	61	67	61	58	60	44	3	1	1140
U.S. GOVT. OWNED	86	10	8	6	12	2	5	3	3	7	4	4	4			154
U.S. INDIV. OWNED	90	11	16	12	20	7	20	29	22	21	18	18	4	1		289
FOREIGN OWNED	2					1		4			1	1				9
FOREIGN ORIGIN	192	31	27	28	37	31	48	51	64	49	43	55	29	2		687
U.S. OWNED	51	6	2	4	9	4	6	3	7	7	5	3	2			109
FOREIGN OWNED	141	25	25	24	28	27	42	48	57	42	38	52	27	2		578
FOREIGN CORP.	108	21	24	24	26	23	37	44	54	35	33	44	26	2		501
FOREIGN GOVT.	4	1				1			1		1	3				11
FOREIGN INDIV.	29	3	1		2	3	5	4	2	7	4	5	1			66

4.3 ANALOG CARRIER WAVE COMMUNICATIONS: OTHER SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1225
TOTAL REFERENCES CITED	9510
U.S. Patent References Cited	8741
Foreign Patent References Cited	274
Other References Cited	495

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	4347
Japan	504
United Kingdom	209
France	155
West Germany	149

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,983,484, Nihon Dengyo Co., Ltd.	23
3,733,430, RCA Corp.	22
3,790,700, Hughes Aircraft Co.	21
3,663,762, Bell Telephone Laboratories, Inc.	14
3,757,225, Telebeam Corp.	13

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Motorola Inc.	273
Bell Telephone Laboratories, Inc.	247
RCA Corp.	110
General Electric Co.	101
United States of America, Navy	87

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

5.0 DIGITAL AND PULSE COMMUNICATIONS

CONTENTS

5.0 DIGITAL AND PULSE COMMUNICATIONS

INTRODUCTION

A pulse is a variation of a voltage or current which normally has a constant value. The variation has an extremely rapid rise and decay time which approaches infinitesimal duration. Digital communication is the transmission of information via a signal which varies in discrete steps, i.e. on-off. Digital information is generally transmitted via coded pulses. Profiles in this section include any communication system which transmits an intelligence-bearing signal in the form of discrete variations in some parameter of an electrical or electromagnetic signal. Specifically excluded are light wave communications via pulses and multiplex systems which use pulse or digital signals, both of which are covered elsewhere.

5.0 DIGITAL AND PULSE COMMUNICATIONS

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	30.3%
FOREIGN SHARE	40.0%
CORPORATE OWNED	90.6%
GOVERNMENT OWNED	3.5%
U.S. OWNED OF FOREIGN	14.9%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 178, All Subclasses

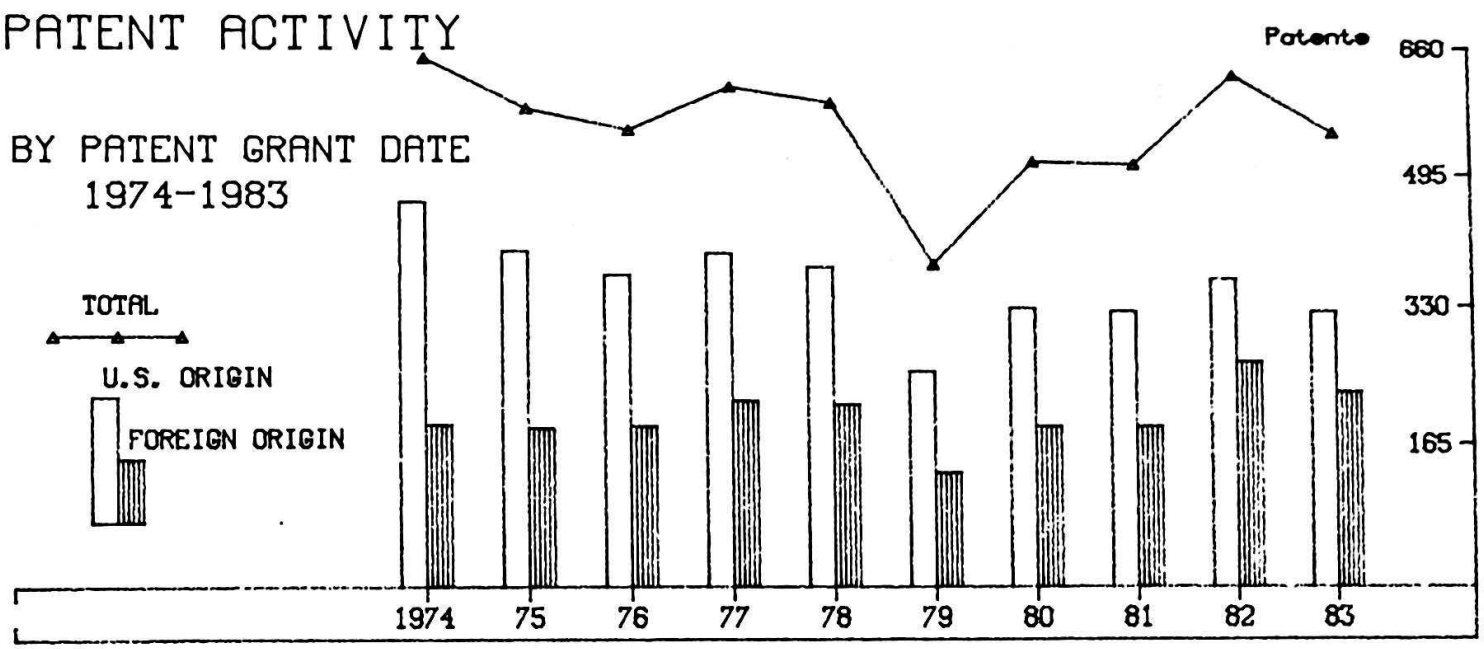
Class 329, Subclasses 104-109

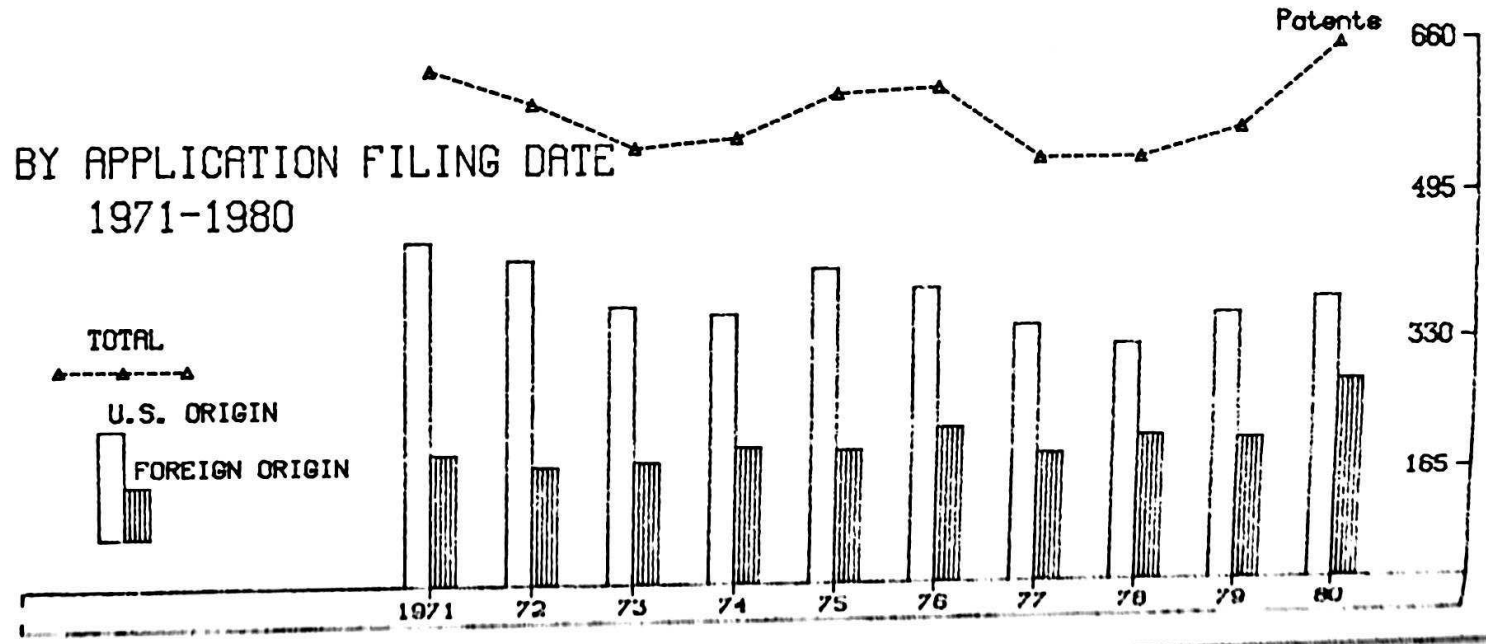
Class 332, Subclasses 9R-15

Class 340, Subclasses 347R, 347DF

Class 371, Subclasses 1-6, 30-71

Class 375, All Subclasses





5.0 DIGITAL AND PULSE COMMUNICATIONS

ORGANIZATIONS ASSIGNED 19 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
601	BELL TELEPHONE LABORATORIES, INC.
590	INTERNATIONAL BUSINESS MACHINES CORP.
275	SIEMENS AG.
226	UNITED STATES OF AMERICA, NAVY
220	U.S. PHILIPS CORP.
184	MOTOROLA INC.
166	INTERNATIONAL STANDARD ELECTRIC CORP.
165	NIPPON ELECTRIC CO., LTD.
164	GENERAL ELECTRIC CO.
157	RCA CORP.
138	SPERRY CORP.
119	WESTINGHOUSE ELECTRIC CORP.
107	BURROUGHS CORP.
107	XEROX CORP.
104	ROCKWELL INTERNATIONAL CORP.
100	HONEYWELL INFORMATION SYSTEMS INC.
91	BENDIX CORP.
88	UNITED STATES OF AMERICA, NASA
87	HONEYWELL INC.
87	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
80	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
80	UNITED STATES OF AMERICA, ARMY
73	FUJITSU LTD.
67	HITACHI, LTD.
67	SINGER CO.
64	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
62	UNITED STATES OF AMERICA, AIR FORCE
61	NCR CORP.
56	COMMUNICATIONS SATELLITE CORP.
54	SONY CORP.
53	TELEFONAKTIEBOLAGET LM ERICSSON
53	TELETYPE CORP.
53	TEXAS INSTRUMENTS, INC.
51	KOKUSAI DENSHIN DENWA K.K.
48	COLLINS RADIO CO.
46	THOMSON-CSF
44	HUGHES AIRCRAFT CO.
44	TOKYO SHIBAURA ELECTRIC CO., LTD.
43	HARRIS CORP.
40	RAYTHEON CO.
36	HEWLETT-PACKARD CO.
36	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
36	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
35	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
35	SOLARTRON ELECTRONIC GROUP LTD.
33	GTE SYLVANIA INC.
32	GENERAL DYNAMICS CORP.
31	CSELT-CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
31	LICENTIA PATENT-VERWALTUNGS-GMBH
31	NORTHERN TELECOM LTD.
29	BUNKER RAMO CORP.
29	OLIVETTI, ING. C., & C. S.P.A.
28	TRW INC.
27	UNITED TECHNOLOGIES CORP.
26	MARCONI CO. LTD.
25	SANDERS ASSOCIATES INC.
23	ANALOG DEVICES, INC.
22	DE STAAT DER NEDERLANDEN, TE DEZEN VERTEGENWOORDIGD DOOR DE
22	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
19	MILGO ELECTRONIC CORP.
19	POST OFFICE
19	RICOH CO., LTD.
19	SCM CORP.

5.0 DIGITAL AND PULSE COMMUNICATIONS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	3863	711	937	767	697	647	581	553	610	589	381	512	508	625	549	12530
U.S. ORIGIN	3159	530	687	564	485	460	398	368	395	378	250	327	323	363	323	9010
FOREIGN ORIGIN	704	181	250	203	212	187	183	185	215	211	131	185	185	262	226	3520
JAPAN	98	23	46	41	54	45	49	47	67	76	42	54	64	94	83	883
WEST GERMANY	134	32	38	39	42	34	32	33	40	33	28	40	30	48	40	643
UNITED KINGDOM	172	41	63	33	32	23	27	29	25	29	11	23	29	22	29	588
FRANCE	89	26	39	30	37	37	29	25	27	23	14	33	25	45	30	509
NETHERLANDS	61	14	17	10	16	13	7	11	13	15	7	12	12	18	10	236
SWITZERLAND	37	10	10	11	10	11	6	7	5	11	9	6	5	5	6	149
ITALY	23	10	11	15	8	6	7	9	13	8	5	7	7	10	5	144
CANADA	30	7	7	6	4	6	15	9	10	6	5	3	2	6	11	127
SWEDEN	23	7	8	10	5	5	2	11	7	6	5	4	3	6	4	106
BELGIUM	11	4	3	3	1	1	2	1	1	1			2	2	2	34
NORWAY	5	4	3	1	1	1	2					1				18
U.S.S.R.	2	1	1	1		1			1	1	2	1	2		3	16
AUSTRALIA	3					1	1	2	3	1			1		1	13
AUSTRIA	3		2		1	1	1		1							9
ISRAEL						1	2				1	1	1	1	1	8
DENMARK	1			1						1				2		5
CZECHOSLOVAKIA	1		1			1			1							4
HUNGARY	1								1		1					3
HONG KONG								1					1			2
POLAND	1	1														2
GREECE	1				1											2
S. AFRICA	1															1
URUGUAY	1															1
CHINA(TAIWAN)														1		1
EGYPT	1															1
FINLAND			1													1
YUGOSLAVIA											1					1
ICELAND				1												1
SINGAPORE				1												1
IRELAND														1		1
IRAN	1															1
INDONESIA	1															1
MONACO	1															1
LUXEMBOURG													1			1
MEXICO	1															1
OTHER(5)	1	1					1							1	1	5
U.S. ORIGIN	3159	530	687	564	485	460	398	368	395	378	250	327	323	363	323	9010
U.S. CORP. OWNED	2724	445	586	478	409	387	335	319	324	318	215	271	283	315	289	7698
U.S. GOVT. OWNED	188	57	55	41	35	36	38	28	40	27	11	25	14	16	15	626
U.S. INDIV. OWNED	242	24	42	44	39	37	24	20	28	32	24	29	17	28	16	646
FOREIGN OWNED	5	4	4	1	2		1	1	3	1		2	9	4	3	40
FOREIGN ORIGIN	704	181	250	203	212	187	183	185	215	211	131	185	185	262	226	3520
U.S. OWNED	176	53	64	36	52	40	32	26	27	35	19	31	30	39	31	691
FOREIGN OWNED	528	128	186	167	160	147	151	159	188	176	112	154	155	223	195	2829
FOREIGN CORP.	459	112	171	150	153	129	140	143	171	164	102	134	142	203	178	2501
FOREIGN GOVT.	17	5	6			1	2	4	5	4	3	4	4	4	3	62
FOREIGN INDIV.	52	11	8	17	7	17	9	13	13	8	7	13	9	16	14	266

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	3638	611	624	588	540	551	599	606	530	531	563	655	350	21		10407
U.S. ORIGIN	2753	447	438	418	365	356	408	386	344	322	358	376	202	14		7187
FOREIGN ORIGIN	885	164	186	170	175	195	191	220	186	209	205	279	148	7		3220
JAPAN	144	39	45	47	41	53	52	77	67	60	63	104	58	4		854
WEST GERMANY	161	24	43	37	22	35	38	39	32	44	35	49	24	2		585
UNITED KINGDOM	194	36	22	26	24	27	23	27	21	30	29	25	19			503
FRANCE	134	26	25	25	39	23	25	27	21	35	30	50	18			478
NETHERLANDS	64	7	15	8	12	10	18	13	5	14	16	19	6			207
SWITZERLAND	43	9	11	5	8	8	5	13	7	7	7	3	3	1		130
ITALY	41	7	12	6	5	7	11	11	9	6	8	9	5			137
CANADA	25	7	4	3	15	13	7	4	10	3	6	8	5			110
SWEDEN	31	5	4	5	3	10	6	6	6	7	4	5	2			94
BELGIUM	14	2	2	1	1	1	2		1		2	3	1			30
NORWAY	11	1		2		2				1						17
U.S.S.R.	3	1		1	1		1		3	1	1		3			15
AUSTRALIA	3			1	2	2	2		1		1		1			13
AUSTRIA	5		1	1	1		1									9
ISRAEL				1		2		1	1	1			2			8
DENMARK			1					1			1	1				4
CZECHOSLOVAKIA	2			1				1								4
HUNGARY	1					1			1							3
HONG KONG						1					1					2
POLAND	2															2
GREECE			1													1
S. AFRICA																
URUGUAY																
CHINA(TAIWAN)												1				1
EGYPT	1															1
FINLAND	1															1
YUGOSLAVIA									1							1
ICELAND	1															1
SINGAPORE	1															1
IRELAND													1			1
IRAN																
INDONESIA	1															1
MONACO																
LUXEMBOURG											1					1
MEXICO	1															1
OTHER(5)	1				1							2				4
U.S. ORIGIN	2753	447	438	418	365	356	408	386	344	322	358	376	202	14		7187
U.S. CORP. OWNED	2321	380	371	350	304	311	342	324	295	282	314	336	172	13		6115
U.S. GOVT. OWNED	238	35	31	31	33	23	36	35	19	14	12	14	14	1		536
U.S. INDIV. OWNED	180	32	34	37	28	20	28	25	29	23	26	22	12			496
FOREIGN OWNED	14		2			2	2	2	1	3	6	4	4			40
FOREIGN ORIGIN	885	164	186	170	175	195	191	220	186	209	205	279	148	7		3220
U.S. OWNED	223	33	35	39	35	29	31	35	22	33	39	39	22	3		618
FOREIGN OWNED	662	131	151	131	140	166	160	185	164	176	166	240	126	4		2602
FOREIGN CORP.	593	118	144	118	123	153	147	171	148	156	152	218	116	4		2361
FOREIGN GOVT.	19	1	1		4	2	4	5	4	5	2	5	2			54
FOREIGN INDIV.	50	12	6	13	13	11	9	9	12	15	12	17	8			187

5.1 DIGITAL AND PULSE COMMUNICATIONS: TRANSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

DEFINITION

This profile includes systems and circuits for forming and transmitting pulses. Also included are pulse modulators, which vary a characteristic of a repetitious pulse wave in accordance with information to be transmitted, and transceivers. Transceivers are combinations of a transmitter and receiver at the same location, which transmit and receive over the same medium to and from the same location.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 5.1 are:

U.S. Patent 4,263,670. This patent is an example of a data modem. The invention uses a microprocessor for processing and control of all transmitter and receiver operations.

U.S. Patent 4,380,746. This patent is an example of a pulse modulator which converts analog information into a series of pulses.

U.S. Patent 4,419,756. This invention is a processor-controlled data set designed to be very flexible in providing different modes of operation.

U.S. Patent 4,425,664. This patent shows another data set. This set is an all-digital set which is "universal" in that it is easily reconfigurable into several different types of data sets.

United States Patent [19]

Sherman

[11] **4,263,670**

[45] **Apr. 21, 1981**

[54] **MICROPROCESSOR DATA MODEM**

[75] Inventor: **James B. Sherman, Huntsville, Ala.**

[73] Assignee: **Universal Data Systems, Inc., Huntsville, Ala.**

[21] Appl. No.: **38,310**

[22] Filed: **May 11, 1979**

[51] Int. Cl.³ H04J 3/12; H04L 27/06

[52] U.S. Cl. 375/9; 364/900; 375/67; 375/84

[58] Field of Search ..... 375/8, 9, 27, 67, 78, 375/79, 84, 85, 86, 53; 178/67.1; 179/2 DP; 364/900

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,747,024	7/1973	Choquet et al.	375/67
3,818,347	6/1974	Holsinger	325/321
3,878,468	4/1975	Falconer et al.	325/320
3,988,540	10/1976	Scott et al.	375/53
4,027,250	5/1977	Lang	325/323
4,035,735	7/1977	Akashi et al.	325/476
4,085,449	4/1978	Walsh et al.	364/900
4,097,807	6/1978	Fujimura	325/42

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"Microprocessor Implementation of High-Speed Data Modems", Van Gerwen et al., IEEE Transactions on Communications, vol. Com-25, No. 2, Feb. 1977.

Bell System Technology Reference—"Data Sets 201A and 201B".

Primary Examiner—Thomas A. Robinson

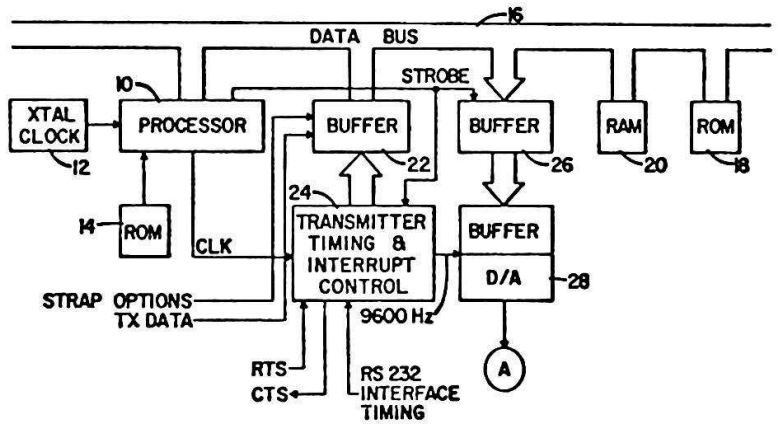
Attorney, Agent, or Firm—Weingarten, Maxham & Schurgin

[57] **ABSTRACT**

A data modem is provided which is operative at a data rate of 4800 bps and employing 8 phase DPSK modulation. The modem includes a microprocessor and associated memories for digital signal processing and control of substantially all transmitter and receiver operations.

12 Claims, 14 Drawing Figures

164



United States Patent [19]

Sun et al.

[11] **4,380,746**

[45] **Apr. 19, 1983**

[54] **PULSE MODULATOR USING CAPACITOR CHARGING AND DISCHARGING CIRCUITS**

[75] Inventors: **Shan C. Sun, Bell, Pa.; Larry L. Church, Jefferson, Ohio**

[73] Assignee: **Westinghouse Electric Corp., Pittsburgh, Pa.**

[21] Appl. No.: **239,917**

[22] Filed: **Mar. 3, 1981**

[51] Int. Cl.³ H03K 7/06

[52] U.S. Cl. ..... 332/9 R; 307/108; 307/271; 328/66; 331/153; 332/14; 375/23; 375/44 65.

[58] Field of Search ..... 332/9 R, 9 T, 11 D, 332/14; 331/111, 143, 153; 375/22, 23, 44; 328/59, 66, 67, 68; 307/265, 271, 108

[56] **References Cited**

U.S. PATENT DOCUMENTS

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4,015,213	3/1977	Hamada	332/9 R X
4,187,439	2/1980	Vesel	307/271
4,253,071	2/1981	Underhill et al.	332/9 T

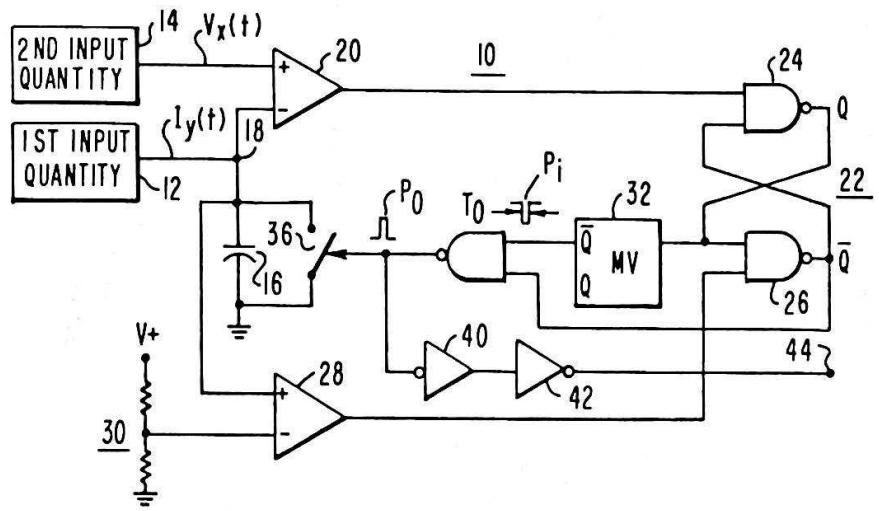
Primary Examiner—Siegfried H. Grimm

Attorney, Agent, or Firm—D. R. Lackey

[57] **ABSTRACT**

A self-starting, non-latching, pulse modulator which will function as an analog divider of first and second input quantities, or as a linear pulse period modulator responsive to one of the quantities, or as a linear pulse frequency modulator responsive to the other of the quantities, depending upon how the first and second input quantities are controlled. The first input quantity is connected to charge a capacitor. The second input quantity is compared in a first comparator with the voltage across the capacitor. A second comparator compares the voltage across the capacitor with a reference voltage. The outputs of the first and second comparators are connected, respectively, to the first and second inputs of a flip-flop which has its first output connected to a monostable multivibrator. The second output of the flip-flop and the output of the monostable multivibrator are both connected so that either one can momentarily activate a discharge circuit for discharging the capacitor.

7 Claims, 3 Drawing Figures



United States Patent [19]
Cheng-Quispe et al.

[11] **4,419,756**
[45] **Dec. 6, 1983**

[54] **VOICEBAND DATA SET**

[75] Inventors: **Enrique Cheng-Quispe, Marlboro; Thomas M. Dennis, Ocean; Emanuel J. Fulcomer, Jr., Little Silver; George Malek, Wanamassa; Shih Y. Tong, Holmdel, all of N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **156,869**

[22] Filed: **Jun. 5, 1980**

[51] Int. Cl.³ **H04B 1/54; G06F 3/00**

[52] U.S. Cl. ..... **375/7; 179/2 DP; 364/900**

[58] Field of Search ..... 375/7, 8, 9; 371/22; 179/2 DP; 370/85, 89.90; 364/900 MS File, 200 MS File

[56] **References Cited**

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4,014,004	3/1977	Fuller	364/900
4,071,887	1/1978	Daly	364/900
4,071,889	1/1978	Sumida	364/900
4,085,449	4/1978	Wash et al.	364/900
4,093,981	6/1978	McAllister	364/200
4,156,931	5/1979	Adelman et al.	364/900
4,263,670	4/1981	Sherman	375/9

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Choquet et al., Microcoded Modem Transmitters 1974, IBM Journey of Research & Development vol. 18, No. 1, pp. 338-351.
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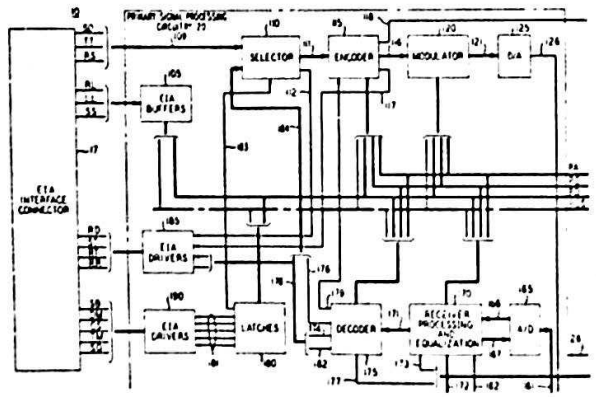
Watanabe "A 4800 BPS Miroprocessor Data Modem" Jun. 12-15, 1977 by Conference Record 1977 International Conf. on Communication, pp. 47.6-252-47.6-256.

Primary Examiner—Benedict V. Safourek
Assistant Examiner—Stephen Chin
Attorney, Agent, or Firm—Ronald D. Slusky

[57] **ABSTRACT**

A full duplex, synchronous data set (**10**) includes primary signal processing circuitry which generates a modulated transmit data signal in response to serial data from a terminal interface (**17**). The modulated data signal is transmitted over a primary channel of a transmit line (**11**). The primary signal processing circuitry also receives modulated data signals from a primary channel of a receive line (**12**) and recovers therefrom a serial bit stream for presentation to the interface. The operating parameters of the primary signal processing circuitry are specified by a primary controller (**30**) over a plurality of buses (PA, PC, PD). The primary controller includes a microprocessor (**310**) and associated peripherals (**315, 320, 325, 330, 335**). The data set also includes secondary signal processing circuitry (**40**) which transmits and receives diagnostic and control information over respective secondary channels of the transmit line and receive lines. The secondary signal processing circuitry is controlled by a secondary controller (**50**) over a plurality of buses (SA, SC, SD). The secondary controller also includes a microprocessor (**510**) and associated peripherals (**515, 520, 525, 530, 535**). The primary and secondary controllers communicate with each other via a bus interface (**60**).

47 Claims, 22 Drawing Figures



United States Patent [19]
Sherman et al.

[11] **4,425,664**
[45] **Jan. 10, 1984**

[54] **MULTIPORT PROGRAMMABLE DIGITAL DATA SET**

[75] Inventors: **David N. Sherman, Middletown; Shiv P. Verma, Lakewood, both of N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **376,262**

[22] Filed: **May 7, 1982**

Related U.S. Application Data

[63] Continuation of Ser. No. 851,156, Nov. 14, 1977, abandoned, which is a continuation of Ser. No. 635,299, Nov. 26, 1975, abandoned.

[51] Int. Cl.³ **H04B 3/50; H04M 3/00; G06F 3/00**

[52] U.S. Cl. ..... 375/8; 340/825; 179/18 ES; 364/900; 364/200

[58] Field of Search ..... 375/5, 8, 9; 178/50, 178/583; 179/15 BA, 15 BV, 18 ES, 340/147 R, 151, 152, 825

[56] **References Cited**

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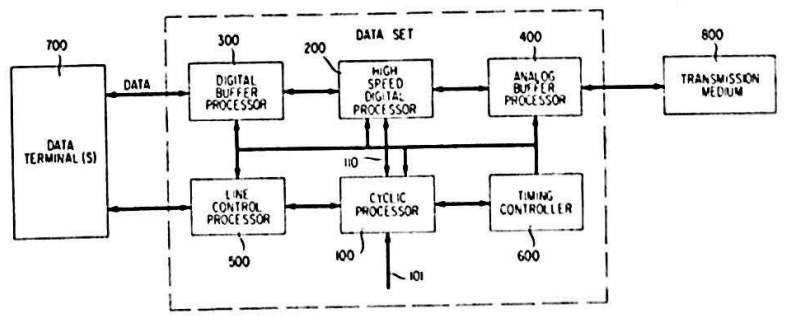
"A 4800 BPS Modem Transmitter Implementation on the PMDS": Abstract: Oyekunle et al.; May 11, 1976.
"High Speed Processing with Asynchronous Modules"; NTC Record 74; pp. 515-519; Tinklepaugh et al.-Dec. 1974.
"The Radar Arithmetic Processing Element as an MTI Filter" *NTC Record 74* pp. 507-514, Shay-Dec. 1974.
"Parallel & Sequential Trade-Offs in Signal Processing Computers"; *NTC Record, 74*-pp. 491-495; Gold, Dec. 1974.

Primary Examiner—Aristotelis M. Psitos
Attorney, Agent, or Firm—Barry H. Freedman

[57] **ABSTRACT**

Disclosed is a programmable universal data set which is defined as a data set that is capable of simultaneously servicing a plurality of data terminals desiring diverse types of data sets for several different transmission speeds and formats. The universal data set comprises analog and digital buffer processors adapted for interfacing with a plurality of data terminals and with a multi-input transmission medium, a high speed digital processor having a "highly parallel" structure for computing the various elemental functions of the diverse types of data sets, and a cyclic processor for controlling the operational sequence of the high speed processor to achieve the overall operation of the selected types of data sets. The cyclic processor includes means for modifying the types of data sets implemented.

11 Claims, 4 Drawing Figures



5.1 DIGITAL AND PULSE COMMUNICATIONS: TRANSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

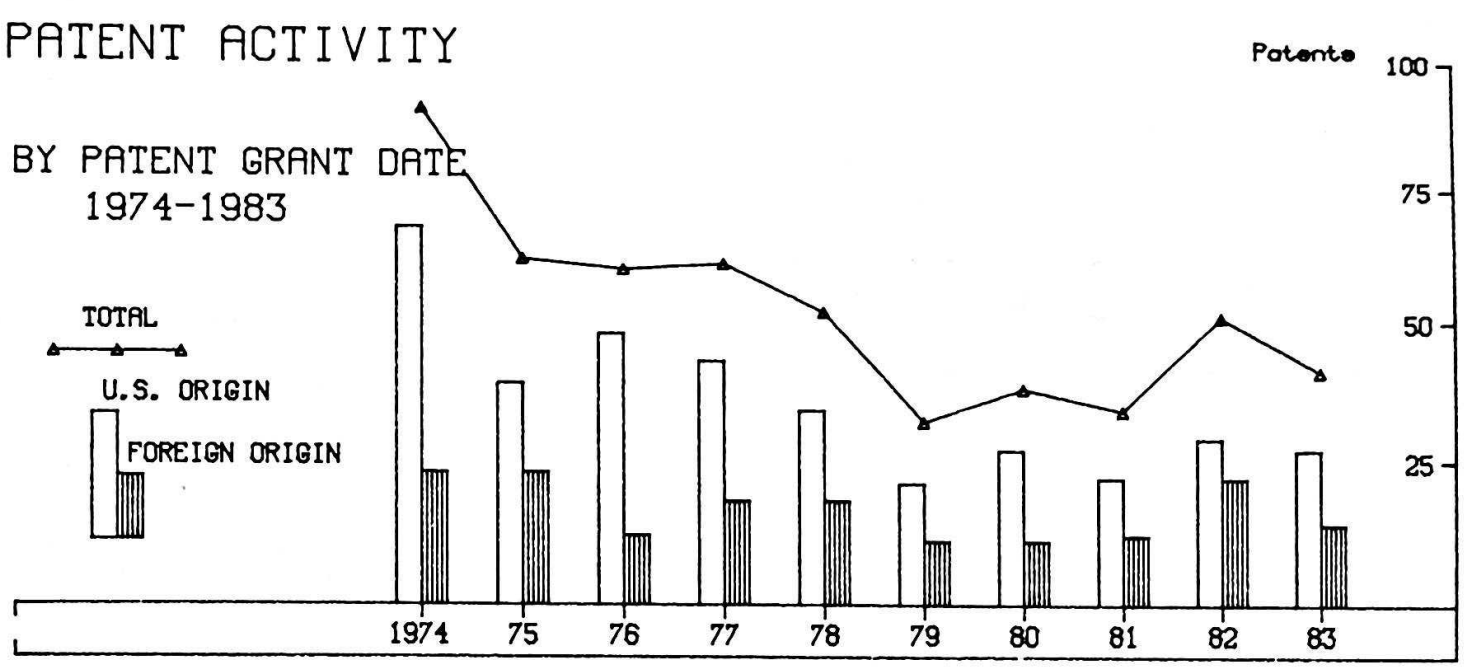
3-YEAR/10-YEAR SHARE	24.1%
FOREIGN SHARE	38.1%
CORPORATE OWNED	85.7%
GOVERNMENT OWNED	4.0%
U.S. OWNED OF FOREIGN	20.8%

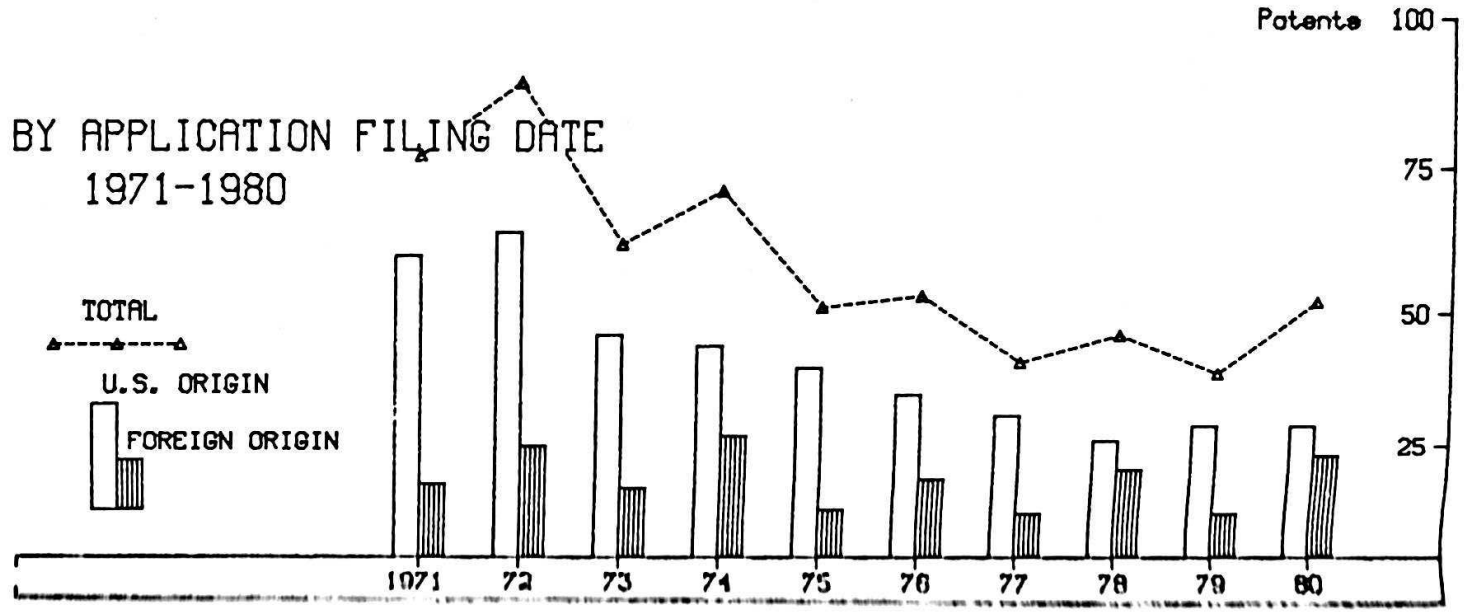
INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 178, Subclasses 79-87, 101-110

Class 332, Subclasses 9R-15

Class 375, Subclasses 7-9, 59-74





5.1 DIGITAL AND PULSE COMMUNICATIONS: TRANSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

ORGANIZATIONS ASSIGNED 4 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
83	BELL TELEPHONE LABORATORIES, INC.
41	U.S. PHILIPS CORP.
39	INTERNATIONAL BUSINESS MACHINES CORP.
25	WESTINGHOUSE ELECTRIC CORP.
24	UNITED STATES OF AMERICA, NAVY
23	GENERAL ELECTRIC CO.
21	SIEMENS AG.
20	RCA CORP.
17	NIPPON ELECTRIC CO., LTD.
15	MOTOROLA INC.
14	HONEYWELL INC.
14	INTERNATIONAL STANDARD ELECTRIC CORP.
13	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
13	SPERRY CORP.
12	UNITED STATES OF AMERICA, ARMY
12	XEROX CORP.
10	COLLINS RADIO CO.
10	COMMUNICATIONS SATELLITE CORP.
9	HUGHES AIRCRAFT CO.
9	RAYTHEON CO.
8	MARCONI CO. LTD.
8	UNITED STATES OF AMERICA, AIR FORCE
8	UNITED STATES OF AMERICA, NASA
7	BURROUGHS CORP.
7	GENERAL DYNAMICS CORP.
7	MILGO ELECTRONIC CORP.
6	FUJITSU LTD.
6	GTE SYLVANIA INC.
6	UNIVERSITE DE SHERBROOKE
5	HARRIS CORP.
5	HITACHI, LTD.
5	ROCKWELL INTERNATIONAL CORP.
5	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
5	SONY CORP.
5	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
5	TELEFONAKTIEBOLAGET LM ERICSSON
4	AUTOMATIC ELECTRIC LABORATORIES INC.
4	BENDIX CORP.
4	DESIGN ELEMENTS, INC.
4	GATES RADIO CO.
4	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
4	INTERTEL, INC.
4	LICENTIA PATENT-VERWALTUNGS-GMBH
4	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
4	NCR CORP.
4	SINGER CO.
4	TEKADE FELTEN GUILLEAUME FERNMELDEANLAGEN GMBH
4	TRW INC.
4	UNITED STATES OF AMERICA, ATOMIC ENERGY COMM.
4	UNIVERSAL DATA SYSTEMS, INC.

5.1 DIGITAL AND PULSE COMMUNICATIONS: TRANSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	523	88	111	77	89	91	62	60	61	52	32	38	34	51	41	1410
U.S. ORIGIN	443	64	77	63	66	68	39	48	43	34	21	27	22	29	27	1071
FOREIGN ORIGIN	80	24	34	14	23	23	23	12	18	18	11	11	12	22	14	339
JAPAN	14	3	7	1	6	5	4	3	5	3	2		4	7	3	67
UNITED KINGDOM	21	8	10	3	2	5	4	1	2	1	1	2	3	1	2	66
WEST GERMANY	17	1	3	1	6	4	5	3	2	4	3	3	3	4	1	60
FRANCE	6	4	3	3	5	1	3		1	3	1	3		4	6	43
NETHERLANDS	7	4	2		1	2	3		4	5	2	3	1	1	1	36
CANADA	7	1	1	1	1	1	2	1	1	1				1	1	19
ITALY	4	1	3	1	1	1	1		1		1			1		15
SWITZERLAND	3	1	2	2		2		2		1	1			1		15
SWEDEN	1	1	2	1	1	1		1								8
BELGIUM			1	1					1							3
ISRAEL						1								1		2
AUSTRALIA								1	1							2
SOUTH KOREA														1		1
LUXEMBOURG													1			1
NORWAY							1									1
U.S. ORIGIN	443	64	77	63	66	68	39	48	43	34	21	27	22	29	27	1071
U.S. CORP. OWNED	364	51	65	51	58	54	33	40	34	26	18	22	18	24	25	883
U.S. GOVT. OWNED	37	7	7	4	3	7	3	6	5	5	1	2	1	3		91
U.S. INDIV. OWNED	40	5	5	8	5	7	3	2	3	3	2	3	3	2	2	93
FOREIGN OWNED	2	1							1							4
FOREIGN ORIGIN	80	24	34	14	23	23	23	12	18	18	11	11	12	22	14	339
U.S. OWNED	23	7	10	2	4	8	9	2	5	5	2	4	3	3	4	91
FOREIGN OWNED	57	17	24	12	19	15	14	10	13	13	9	7	9	19	10	248
FOREIGN CORP.	52	17	22	11	19	13	14	10	12	13	9	6	9	17	5	229
FOREIGN GOVT.	1		1			1			1						1	5
FOREIGN INDIV.	4		1	1		1						1		2	4	14

5.1 DIGITAL AND PULSE COMMUNICATIONS: TRANSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	431	76	77	89	62	71	51	53	41	46	39	52	23	3		1114
U.S. ORIGIN	333	60	60	64	46	44	40	35	31	26	29	29	14	3		814
FOREIGN ORIGIN	98	16	17	25	16	27	11	18	10	20	10	23	9			300
JAPAN	18	2	5	4	3	6	2	5	2	3	2	6	3			61
UNITED KINGDOM	27	4	1	4	4	3		2		3	3	3				54
WEST GERMANY	15	1	4	6	4	4	3	3	3	5	1	4	1			54
FRANCE	12	3	2	4	1	2	1	3	2	2	1	6	3			42
NETHERLANDS	6	1	1	1	2	3	3	5		6		1	1			30
CANADA	4	1	1	1	2	1	1		1			2				14
ITALY	7	1	1	1		2				1	1					14
SWITZERLAND	5	2		2		2			2		1					14
SWEDEN	3	1	1	1		1										7
BELGIUM	1		1				1									3
ISRAEL				1									1			2
AUSTRALIA						2										2
SOUTH KOREA												1				1
LUXEMBOURG											1					1
NORWAY						1										1
U.S. ORIGIN	333	60	60	64	46	44	40	35	31	26	29	29	14	3		814
U.S. CORP. OWNED	276	50	47	56	35	38	31	28	27	21	26	25	12	3		675
U.S. GOVT. OWNED	31	5	5	3	7	2	6	5	2	1	1	3				71
U.S. INDIV. OWNED	23	5	8	5	4	3	3	2	2	4	2	1	2			64
FOREIGN OWNED	3					1										4
FOREIGN ORIGIN	98	16	17	25	16	27	11	18	10	20	10	23	9			300
U.S. OWNED	31	4	1	9	3	10	4	5		7	2	3	4			83
FOREIGN OWNED	67	12	16	16	13	17	7	13	10	13	8	20	5			217
FOREIGN CORP.	64	11	15	16	11	17	7	13	10	12	8	15	3			202
FOREIGN GOVT.	2				2								1			5
FOREIGN INDIV.	1	1	1							1		5	1			10

5.1 DIGITAL AND PULSE COMMUNICATIONS: TRAMSMITTERS INCLUDING DIGITAL MODULATORS AND TRANSCEIVERS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	431
TOTAL REFERENCES CITED	2315
U.S. Patent References Cited	2097
Foreign Patent References Cited	53
Other References Cited	165

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	1432
Japan	116
United Kingdom	70
France	68
West Germany	64

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,806,806, Bell Telephone Laboratories, Inc.	13
3,699,566, Unassigned	8
3,857,111, Universite De Sherbrooke	7
3,878,465, Universite De Sherbrooke	6
3,815,033, Bell Telephone Laboratories, Inc.	6

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	204
International Business Machines Corp.	89
U.S. Philips Corp.	51
Motorola Inc.	50
General Electric Co.	43

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS, INCLUDING DEMODULATORS, REPEATERS AND EQUALIZERS

DEFINITION

Receivers and demodulators include apparatus to decode, demodulate, or otherwise recapture the intelligence from the received pulse signal. Repeaters receive and then retransmit a pulse signal, usually at a higher energy level. Equalizers are a network of delay lines and attenuators which permit an incoming pulse signal to be adjusted in time and amplitude to meet the requirements of a circuit using the signal.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 5.2 are:

U.S. Patent 4,298,986. This invention is a phase-shift-modulated digital data receiver.

U.S. Patent 4,320,523. This invention is an example of a digital radio receiver.

U.S. Patent 4,378,526. This patent shows a demodulator for a pulse-code modulated signal. This demodulator is designed to eliminate one step in demodulation.

U.S. Patent 4,399,547. This invention is a receiver circuit for a power line phase modulated signal system. It is designed to prevent errors resulting from changes in the power factor as the length of the power line changes.

United States Patent [19]

Hughes

[11] **4,298,986**

[45] **Nov. 3, 1981**

[54] **RECEIVER FOR PHASE-SHIFT MODULATED CARRIER SIGNALS**

[75] Inventor: **William C. Hughes, Scotia, N.Y.**

[73] Assignee: **General Electric Company, Schenectady, N.Y.**

[21] Appl. No.: **106,451**

[22] Filed: **Dec. 26, 1979**

[51] **Int. Cl.**³ **H04L 27/22**; H04L 27/06; H03D 3/22

[52] **U.S. Cl.** **375/84**; 375/97; 375/119; 329/124

[58] **Field of Search** ..... 375/80, 81, 82, 84, 375/106, 118, 119, 120, 97; 340/170, 171 R; 329/122, 124, 145; 328/133, 55; 330/294, 302, 303, 306

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,196,352	7/1965	Hopner et al.	375/61
3,466,550	9/1969	Wolf et al.	375/82
3,611,142	10/1971	Welti	375/81
3,899,741	8/1975	Brandt et al.	329/122
3,944,723	3/1976	Fong	178/3
3,944,932	3/1976	Fong	455/271
3,973,087	8/1976	Fong	179/170 R
3,973,240	8/1976	Fong	340/151
4,101,834	7/1978	Stutt et al.	340/310 A
4,109,204	8/1978	Kincaid et al.	340/310 A
4,135,181	1/1979	Bogacki	340/310 A
4,161,720	7/1979	Bogacki	340/150
4,213,096	7/1980	Daniel, Jr.	329/124

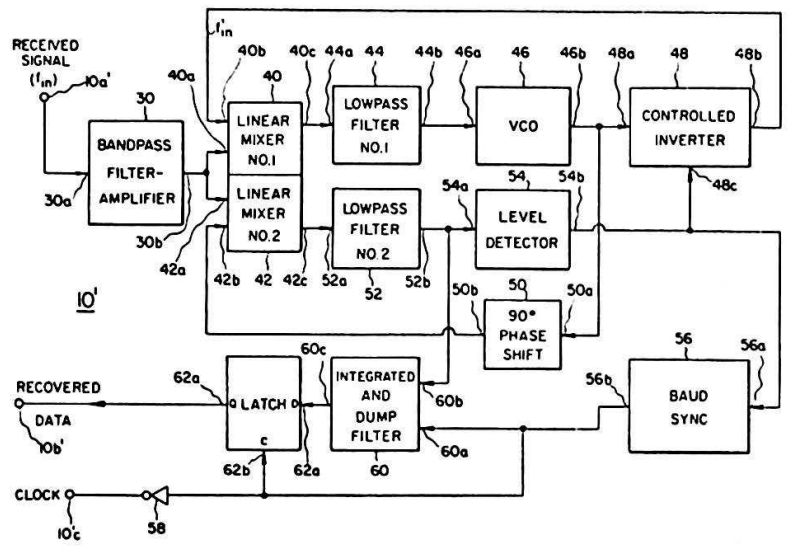
Primary Examiner—Benedict V. Safourek
Attorney, Agent, or Firm—Geoffrey H. Krauss; James C. Davis, Marvin Snyder

[57] **ABSTRACT**

A receiver for recovering digital data from a phase-shift-modulated carrier in a data communications system, utilizes a relatively wide band-pass filter providing the received modulated signal to a pair of phase-locked loops. The first phase-locked loop provides a local oscillator signal tracking the exact frequency and phase of the received signal, which is itself locked to a multiple of a system-wide frequency. The second phase-locked loop acts as a synchronous data detector. Inversion circuitry, in the first phase lock loop, is controlled by the detected data output from the second phase-lock loop, for preventing the 180° phase modulation from disturbing the frequency-tracking local oscillator phase-lock loop.

23 Claims, 4 Drawing Figures

172



United States Patent [19]

Horikawa et al.

[11] **4,320,523**

[45] **Mar. 16, 1982**

[54] **DIGITAL SIGNAL RECEPTION SYSTEM**

[75] Inventors: **Izumi Horikawa, Yokohama; Masaaki Shinji, Sekiu, both of Japan**

[73] Assignee: **Nippon Telegraph & Telephone Public Corporation, Tokyo, Japan**

[21] Appl. No.: **118,229**

[22] Filed: **Feb. 4, 1980**

[30] **Foreign Application Priority Data**

Feb. 13, 1979 [JP] Japan 54-14360

[51] **Int. Cl.**³ **H04B 1/10**

[52] **U.S. Cl.** **375/103**; 455/307

[58] **Field of Search** 375/4, 99, 100, 101, 375/103, 455/63, 135, 295, 296, 299, 306, 307, 311, 312; 364/574, 825

[56] **References Cited**

U.S PATENT DOCUMENTS

3,737,799	6/1973	Stander	455/307
3,902,014	8/1975	Lindell	375/4
3,932,818	1/1976	Masak	375/103
4,085,368	4/1978	Yeh	375/101
4,123,625	10/1978	Chow	375/4
4,130,806	12/1978	Van Gerwen	375/103

OTHER PUBLICATIONS

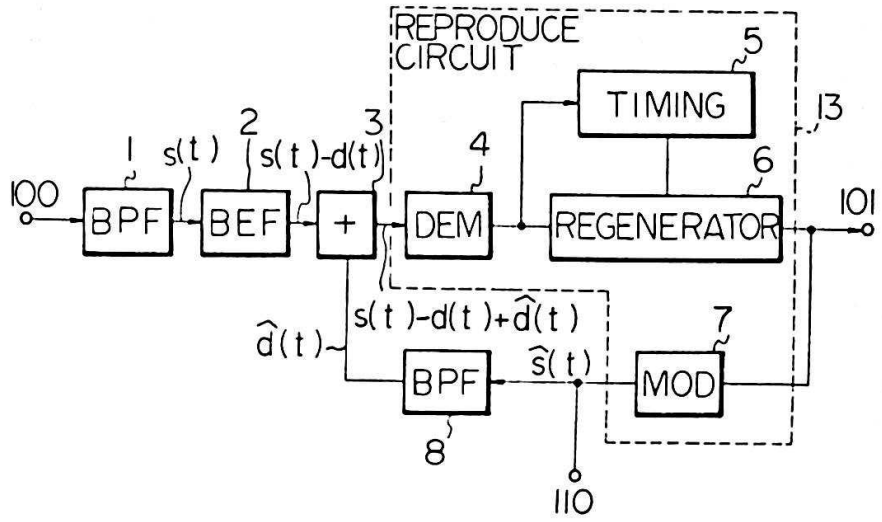
Equalization Design for a 600 MBD Quantized Feedback PCM Repeater, by B. Gibson, IEEE Transactions on Communications, vol. COM-27, No. 1, Jan. 1979, pp. 134-141.

Primary Examiner—Jin F. Ng
Assistant Examiner—Tommy P. Chin
Attorney, Agent, or Firm—Martin Novack

[57] **ABSTRACT**

The error rate performance of a digital radio system which is deteriorated due to inband interference components can be effectively improved by adopting the present digital signal reception technique. According to the present invention, a narrow band band-elimination filter removes the interference, and after the digital signal is regenerated, the spectrum, which is removed by said band-elimination filter, is recovered from the regenerated digital signal. The recovered digital signal is added to the original one, and is applied to the regenerator. Thus, even though an interference component interfers with the digital signal in the same pass-band, said interference component is removed by the present invention and one can obtain the digital signal without the interference component.

15 Claims, 11 Drawing Figures



United States Patent [19]
Champagne et al.

[11] **4,378,526**
[45] **Mar. 29, 1983**

[54] **PULSE CODE DEMODULATOR FOR FREQUENCY SHIFT KEYED DATA**

[75] Inventors: **Claude J. J. Champagne**, Carleton Place; **Ernst A. Munter**, Kanata, both of Canada

[73] Assignee: **Northern Telecom Limited**, Montreal, Canada

[21] Appl. No.: **190,904**

[22] Filed: **Sep. 25, 1980**

[51] Int. Cl.³ **H04L 27/14**
[52] U.S. Cl. **329/104**; 375/82; 375/88; 340/825.58
[58] Field of Search 329/104, 106, 107; 375/80, 82, 88; 340/825.58

[56] **References Cited**

U.S. PATENT DOCUMENTS

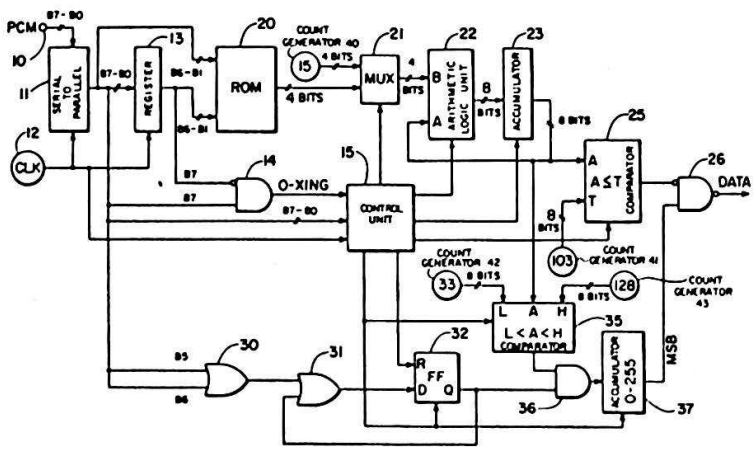
3,908,169 9/1975 Tong 375/82

Primary Examiner—Siegfried H. Grimm
Assistant Examiner—Edward P Westin
Attorney, Agent, or Firm—John E. Mowle

[57] **ABSTRACT**

A demodulator which directly decodes Pulse Code Modulated Signals initially modulated by Frequency Shift Keyed Data by determining the period between zero crossings. The instant of the zero crossing between PCM signal samples is determined by interpolation from the magnitude of the samples immediately preceding and succeeding the zero crossing upon detection of a change in the sign bit of the PCM signal.

4 Claims, 1 Drawing Figure



United States Patent [19]
Moore et al.

[11] **4,399,547**
[45] **Aug. 16, 1983**

[54] **RECEIVER OF PULSED PHASE MODULATED SIGNALS**

[75] Inventors: **Herbert E. Moore**, Pasadena; **Thomas E. Flanders**, Houston, both of Tex.

[73] Assignee: **General Electric Co.**, Philadelphia, Pa.

[21] Appl. No.: **317,117**

[22] Filed: **Nov. 2, 1981**

[51] Int. Cl.³ **H03K 9/06**
[52] U.S. Cl. ..... **375/83**; 375/94; 340/310 A
[58] Field of Search ..... 375/52, 78, 83, 84, 375/94, 95; 340/310 R, 310 A, 858; 329/110, 112; 328/55, 133, 155; 307/510, 511, 514

[56] **References Cited**

U.S. PATENT DOCUMENTS

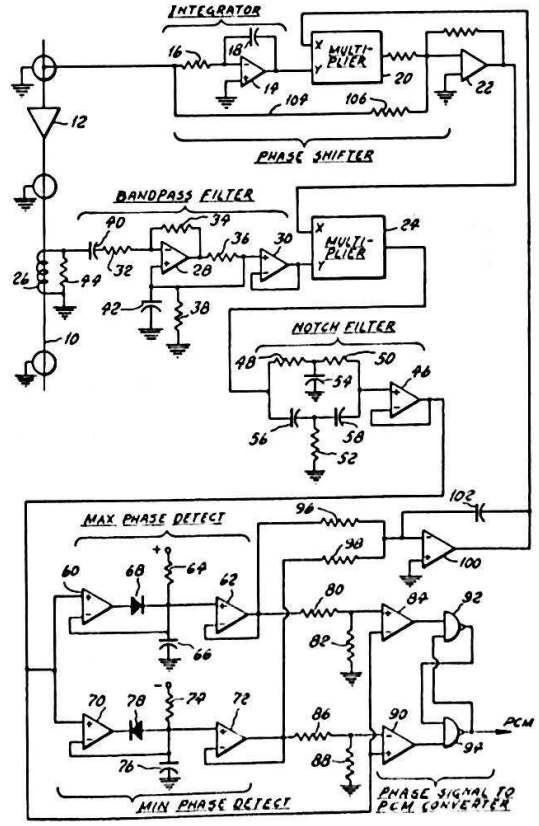
3,959,767 5/1976 Smither et al. 340/858
4,311,964 1/1982 Boykin 375/83

Primary Examiner—Benedict V. Safourek
Assistant Examiner—Stephen Chin
Attorney, Agent, or Firm—Allen E. Amgott

[57] **ABSTRACT**

A receiver of pulsed phase modulated signals is disclosed. These signals are produced by switching a reactance on and off a power line. The receiver produces a sinusoidal current in phase with the current on the power line and a sinusoidal voltage nominally 90 degrees out of phase with the voltage on the power line. These sinusoids are multiplied together to produce a sinusoid of double the original frequency (which may be filtered out) and voltage levels (positive when the reactance is on line and negative when it is off). The absolute value difference between these voltage levels (if any) is used as an error voltage for feedback. The voltage sinusoid is modified by this feedback.

5 Claims, 1 Drawing Figure



5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS INCLUDING DEMODULATORS, REPEATERS AND EQUALIZERS

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

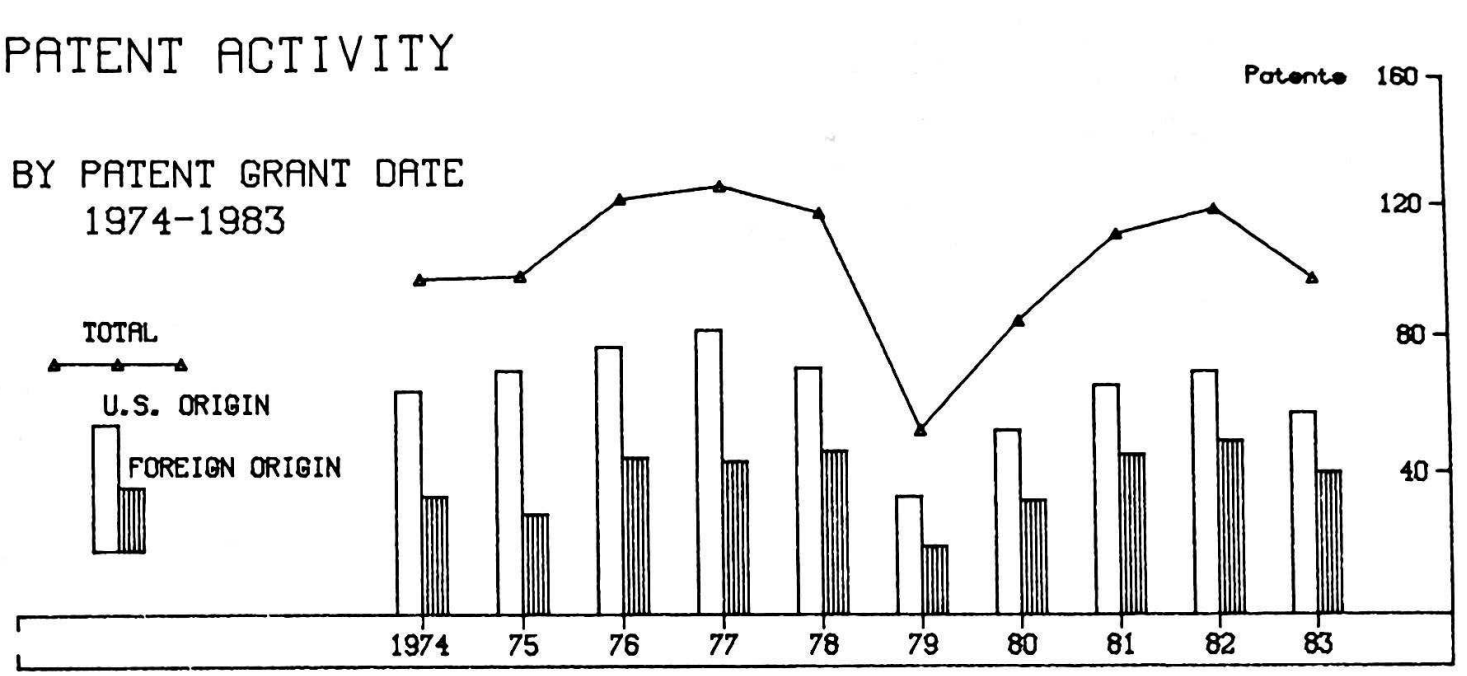
3-YEAR/10-YEAR SHARE	32.0%
FOREIGN SHARE	41.2%
CORPORATE OWNED	93.8%
GOVERNMENT OWNED	3.4%
U.S. OWNED OF FOREIGN	23.1%

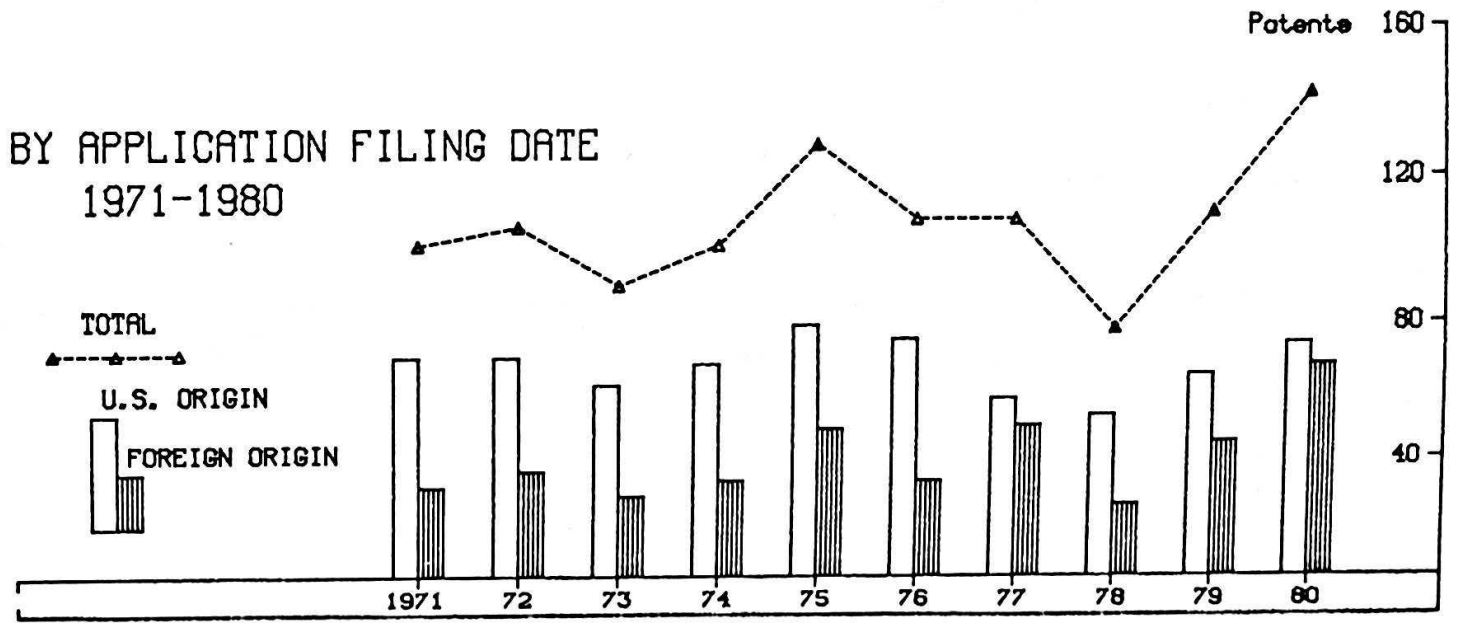
INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 178, Subclasses 70R-73, 118-120 (including 89-100)

Class 329, Subclasses 104-109

Class 375, Subclasses 3, 4, 11-16, 75-105





5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS INCLUDING DEMODULATORS, REPEATERS, AND EQUALIZERS

ORGANIZATIONS ASSIGNED 5 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
134	BELL TELEPHONE LABORATORIES, INC.
81	INTERNATIONAL BUSINESS MACHINES CORP.
59	NIPPON ELECTRIC CO., LTD.
59	U.S. PHILIPS CORP.
57	UNITED STATES OF AMERICA, NAVY
50	MOTOROLA INC.
40	SIEMENS AG.
37	ROCKWELL INTERNATIONAL CORP.
30	GENERAL ELECTRIC CO.
29	INTERNATIONAL STANDARD ELECTRIC CORP.
25	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
24	RCA CORP.
22	COLLINS RADIO CO.
22	SPERRY CORP.
22	XEROX CORP.
21	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
20	UNITED STATES OF AMERICA, ARMY
21	WESTINGHOUSE ELECTRIC CORP.
20	HARRIS CORP.
20	KOKUSAI DENSHIN DENWA K.K.
20	UNITED STATES OF AMERICA, NASA
19	COMMUNICATIONS SATELLITE CORP.
19	FUJITSU LTD.
16	HONEYWELL INC.
16	NCR CORP.
16	UNITED STATES OF AMERICA, AIR FORCE
15	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A
14	RAYTHEON CO.
12	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
11	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
11	GTE SYLVANIA INC.
11	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
10	TELECOMMUNICATIONS RADIOELECTRIQUES ET TELEPHONIQUES T.R.T.
10	THOMSON-CSF
9	GENERAL DYNAMICS CORP.
9	HONEYWELL INFORMATION SYSTEMS INC.
9	MILGO ELECTRONIC CORP.
9	SINGER CO.
8	FORD AEROSPACE & COMMUNICATIONS CORP.
8	HYCOM INC.
8	SANDERS ASSOCIATES INC.
7	CODEX CORP.
7	TEXAS INSTRUMENTS, INC.
6	CHARLES STARK DRAPER LABORATORY, INC.
6	E-SYSTEMS, INC.
6	GENERAL ELECTRIC CO. LTD.
6	LICENTIA PATENT-VERWALTUNGS-GMBH
6	MAGNAVOX CO.
6	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
6	NIXDORF COMPUTER AG.
6	RIXON, INC.
6	SIGNATRON, INC.
6	TELEFONAKTIEBOLAGET LM ERICSSON
6	TELETYPE CORP.
6	TRW INC.
5	BUNKER RAMO CORP.
5	BURROUGHS CORP.
5	HUGHES AIRCRAFT CO.
5	NORTHROP CORP.
5	PLESSEY HANDEL UND INVESTMENTS AG.

5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS INCLUDING DEMODULATORS, REPEATERS AND EQUALIZERS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	513	98	128	122	147	96	97	120	124	116	52	84	110	118	97	2022
U.S. ORIGIN	422	72	103	93	103	63	69	76	81	70	33	52	65	69	57	1428
FOREIGN ORIGIN	91	26	25	29	44	33	28	44	43	46	19	32	45	49	40	594
JAPAN	20	2	11	6	15	9	7	11	13	18	5	7	12	16	9	161
FRANCE	16	7	3	6	7	13	7	9	7	8	7	9	11	7	10	127
WEST GERMANY	6	3	4	5	8	4	3	7	8	4	3	4	4	7	7	77
UNITED KINGDOM	24	4	3	2	3	2	4	5	3	5	1	2	4	5	5	72
NETHERLANDS	5	2	3	4	3	2	3	6	2	2		6	7	7	2	54
ITALY	3	2		1	1			3	4	3	2	1	5	3	2	30
SWITZERLAND	6	4	1	2	3	1	1	1	2	1			1			23
CANADA	1				1	2	1		4	3		2			3	17
SWEDEN	4			1	3		1	1			1	1	1	1		14
BELGIUM	3	1					1			1				2	1	9
DENMARK				1										1		2
AUSTRALIA								1		1						2
HUNGARY	1															1
TURKEY	1															1
URUGUAY	1															1
ICELAND				1												1
U.S.S.R.															1	1
BOLIVIA		1														1
U.S. ORIGIN	422	72	103	93	103	63	69	76	81	70	33	52	65	69	57	1428
U.S. CORP. OWNED	350	51	83	81	88	53	54	64	70	60	29	43	58	64	51	1199
U.S. GOVT. OWNED	45	15	15	7	8	9	11	10	8	5	3	3	3	2	4	148
U.S. INDIV. OWNED	26	3	5	5	7	1	4	1	3	5	1	6		3	2	72
FOREIGN OWNED	1	3						1					4			9
FOREIGN ORIGIN	91	26	25	29	44	33	28	44	43	46	19	32	45	49	40	594
U.S. OWNED	20	10	7	5	9	8	10	9	8	11	3	10	11	13	7	141
FOREIGN OWNED	71	16	18	24	35	25	18	35	35	35	16	22	34	36	33	453
FOREIGN CORP.	64	14	17	22	33	24	16	33	32	33	15	18	33	34	31	419
FOREIGN GOVT.	3	2	1				1	1	1			1	1			11
FOREIGN INDIV.	4			2	2	1	1	1	2	2	1	3		2	2	23

5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS INCLUDING DEMODULATORS, REPEATERS AND EQUALIZERS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	556	101	101	106	90	101	128	108	108	78	110	142	65	7		1801
U.S. ORIGIN	437	75	70	70	62	68	79	75	58	53	65	74	43	5		1234
FOREIGN ORIGIN	119	26	31	36	28	33	49	33	50	25	45	68	22	2		567
JAPAN	31	7	7	17	4	10	10	14	16	5	11	23	2	2		159
FRANCE	22	5	3	7	12	7	8	7	14	7	10	13	6			121
WEST GERMANY	12	4	10	4	2	5	9	4	4	2	5	7	7			75
UNITED KINGDOM	21	3	2	2	2	6	5	1	4	3	3	7	3			62
NETHERLANDS	10	3	4	1	2	2	8	1	1	4	8	9	1			54
ITALY	5	1		1			5	3	4	1	5	4	1			30
SWITZERLAND	9	2	2	1	2		3	1			1					21
CANADA				2	2	1	1	2	4	1	1	1	1			16
SWEDEN	2	1	2	1	1	1			1	2		1				12
BELGIUM	4					1			1			3				9
DENMARK			1								1					2
AUSTRALIA					1				1							2
HUNGARY	1															1
TURKEY																
URUGUAY																1
ICELAND	1												1			1
U.S.S.R.																1
BOLIVIA	1															
U.S. ORIGIN	437	75	70	70	62	68	79	75	58	53	65	74	43	5		1234
U.S. CORP. OWNED	343	65	62	56	54	57	69	64	48	47	59	69	37	5		1035
U.S. GOVT. OWNED	65	6	4	9	6	10	7	7	5	2	2	2	4			129
U.S. INDIV. OWNED	25	4	4	5	2	1	2	3	5	3	2	3	2			61
FOREIGN OWNED	4						1	1		1	2					9
FOREIGN ORIGIN	119	26	31	36	28	33	49	33	50	25	45	68	22	2		567
U.S. OWNED	32	7	5	4	10	6	13	9	9	8	12	16	5			136
FOREIGN OWNED	87	19	26	32	18	27	36	24	41	17	33	52	17	2		431
FOREIGN CORP.	79	18	24	31	16	26	33	24	37	14	31	51	15	2		401
FOREIGN GOVT.	4				1		2			1	1					9
FOREIGN INDIV.	4	1	2	1	1	1	1		4	2	1	1	2			21

5.2 DIGITAL AND PULSE COMMUNICATIONS: RECEIVERS INCLUDING DEMODULATORS, REPEATERS, AND EQUALIZERS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	918
TOTAL REFERENCES CITED	5130
U.S. Patent References Cited	4698
Foreign Patent References Cited	96
Other References Cited	336

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	3134
Japan	362
France	219
United Kingdom	149
West Germany	113

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,868,603, Telecommunications Radioelectriques Et Telephoniques	21
3,878,468, Bell Telephone Laboratories, Inc.	19
3,993,956, Motorola Inc.	14
3,971,996, Hycom Inc.	12

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	432
International Business Machines Corp.	199
Nippon Electric Co., Ltd.	129
Motorola Inc.	115
United States of America, Navy	114

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT, SECRET COMMUNICATION AND MULTILEVEL SYSTEMS

DEFINITION

This profile includes patents disclosing a particular technique or method of modulating the pulse signal to encode desired information. Pulses can be modulated by number, width, position and amplitude. Also included are miscellaneous pulse communication systems such as secret systems and systems using alternating current.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 5.3 are:

U.S. Patent 4,199,722. This patent is an example of a delta modulation system. In delta systems only the change in magnitude between consecutive samples, rather than the magnitude itself, is transmitted. This conserves bandwidth.

U.S. Patent 4,207,524. This patent is a system for encoding and decoding weak signals. It is intended to be used for relatively short distance, remote control devices such as cordless telephones and automobile starters.

U.S. Patent 4,314,371. This patent shows a voice communication system for use in a high noise environment. It finds application in systems such as citizens band radios. In this system, a receiver is activated only when an incoming signal is preceded by a specified 24-bit address.

U.S. Patent 4,383,322. This patent is an example of a pseudo noise or spread spectrum coding system.

United States Patent [19]

Paz

[11] **4,199,722**

[45] **Apr. 22, 1980**

[54] **TRI-STATE DELTA MODULATOR**

[76] Inventor: **Israel Paz, 112 Shd. Hanasy, Haifa, Israel, 34642**

[21] Appl. No.: **701,449**

[22] Filed: **Jun. 30, 1976**

[51] **Int. Cl.²** **H03K 13/22**

[52] **U.S. Cl.** **375/27**

[58] **Field of Search** ..... 332/11 D; 358/260, 261, 358/133, 135, 262; 325/38 B, 38 R, 38 A

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,568,721	9/1951	De Loraine	325/38 B
2,897,275	7/1959	Bowers	325/38 B
2,905,756	9/1959	Graham	358/135
2,916,553	12/1959	Crowley	325/38 B
3,273,141	9/1966	Hackett	325/38 B
3,402,352	9/1968	Lerner	325/38 B
3,706,944	12/1972	Tewksbury	325/38 B
3,716,803	2/1973	Candy	325/38 B
3,769,453	10/1973	Bahl	358/261
3,795,900	3/1974	Monford	325/38 B
3,813,485	5/1974	Arps	358/261
3,937,871	2/1976	Robinson	358/261
3,973,199	8/1976	Widmer	325/38 B
4,087,754	5/1978	Song	325/38 B
4,101,881	7/1978	De Freitas	325/38 B

OTHER PUBLICATIONS

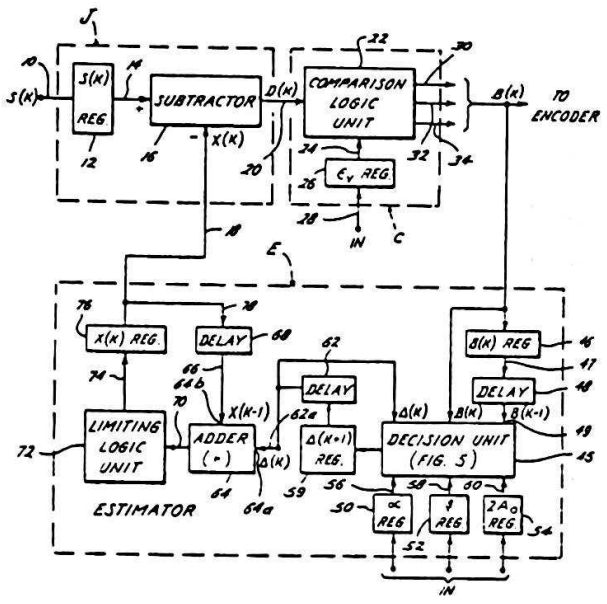
"Digital Pitch Detector Using Delta Modulator and Limited-Length Bit-Pattern Generator", Frei et al., IBM Tech. Disc. Bulletin, vol. 16, #4, pp. 1650–1651, Sep. 1973.

Primary Examiner—Benedict V. Safourek
Assistant Examiner—Michael A. Masinick
Attorney, Agent, or Firm—Marvin J. Marnock; John R. Manning; Marvin F. Matthews

[57] **ABSTRACT**

A delta modulation system with an encoder for encoding successive samples of an analog signal during successive sample intervals into a digital status change code signal indicating the difference between a sample and an estimate of the sample as one of three states: increasing, decreasing or unchanged in status. The status change code signal is transmitted to a decoder which reconstructs the analog signal from the digital status change signal. The status change code signal is also used in the encoder to estimate the next sample of the analog signal.

12 Claims, 10 Drawing Figures



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United States Patent [19]

Purchase

[11] **4,207,524**

[45] **Jun. 10, 1980**

[54] **RADIO COUPLED DEVICE FOR DETECTING AND ANALYZING WEAK TRANSMISSIONS**

[76] Inventor: **Francis J. Purchase, 130 Columbia St. W., Waterloo, Ontario, Canada**

[21] Appl. No.: **863,851**

[22] Filed: **Dec. 23, 1977**

[51] **Int. Cl.²** **H04B 1/12**

[52] **U.S. Cl.** ..... **375/22**; 340/167 A; 375/34; 375/96

[58] **Field of Search** ..... 340/167 A, 167 R; 325/38 R, 42, 55, 64, 65, 302, 321, 323

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,510,777	5/1970	Gordon	325/55
3,852,713	12/1974	Roberts	340/167 A
3,906,348	9/1975	Willmott	325/55
4,006,462	2/1977	Podowski	340/167 A
4,020,477	4/1977	Holland	340/167 R
4,095,211	6/1978	Shaughnessy	325/55

FOREIGN PATENT DOCUMENTS

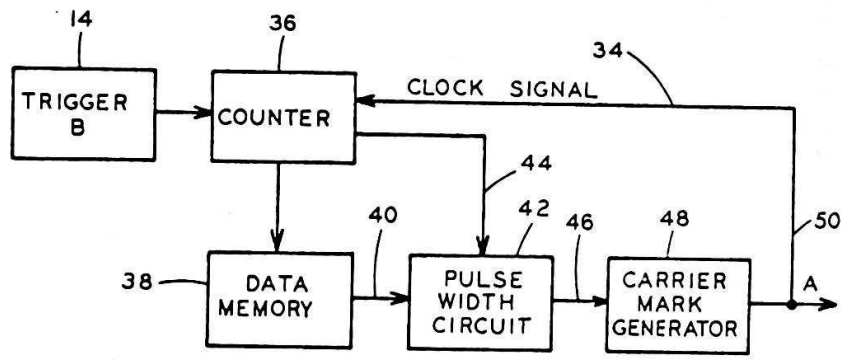
424216	9/1974	U.S.S.R.	340/167 R

Primary Examiner—Robert L. Griffin
Assistant Examiner—Michael A. Masinick

[57] **ABSTRACT**

A signalling device employing radio frequencies in which the transmitter produces a weak, or relatively weak, encoded transmission within a crowded frequency band and an associated receiver which includes a processor capable of detecting and analyzing the weak signal by applying significance to each signal parameter including pulse width, word length, pulse characteristic, number of bits; and, imposing the further requirement that the same parameters must be perceived a second time within a prescribed 0.2-0.8 sec. interval to insure that the signal has been produced by a correctly encoded transmitter and not by a mere random reception. It is a characteristic of the signal processor that it search the received transmission, digitally analyze the encoded signal notwithstanding high noise/signal ratio, and detect the presence of the encoded signal, and then operate a system after having authenticated a transmission and reception of the encoded signal by requiring a second detection of the encoded signal within a prescribed time. In this way, the system is free of spurious actuations arising from mere random duplication of the encoded signal.

7 Claims, 10 Drawing Figures



United States Patent [19]
Covington et al.

[11] **4,314,371**
[45] **Feb. 2, 1982**

[54] **DIGITAL RADIO COMMUNICATIONS SYSTEM WITH HIGH NOISE IMMUNITY**

[76] Inventors: **Edward L. Covington**, Rte. 1, Claremore, Okla. 74017; **Herman D. Self**, 1225 E. Freeport, Broken Arrow, Okla. 74012

[21] Appl. No.: **67,709**

[22] Filed: **Aug. 17, 1979**

[51] **Int. Cl.**³ **H04B 1/16**; H04L 27/00; H04Q 9/12

[52] **U.S. Cl.** 375/58; 455/38; 340/825.44, 340/825.65

[58] **Field of Search** ..... 375/58, 21, 22; 455/31, 455/38, 50, 63, 70; 340/311, 171 PF, 167, 171 R, 359, 360, 168 B

[56] **References Cited**

U.S. PATENT DOCUMENTS

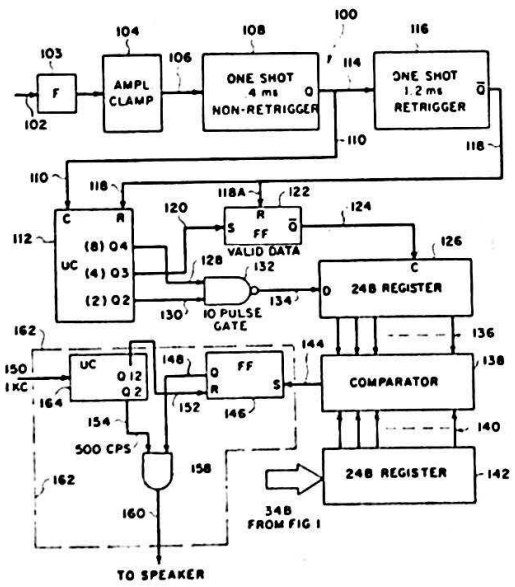
2,941,161	6/1960	Scantlin	455/31
3,510,777	5/1970	Gordon	455/38
3,551,815	12/1970	Berman	455/38
3,906,348	9/1975	Willmott	340/168 R
4,019,142	4/1977	Wycoff	340/171 PF
4,037,201	7/1977	Willmott	340/311
4,075,564	2/1978	Masur et al.	340/311
4,121,198	10/1978	Tsuboi et al.	340/171 R

Primary Examiner—Donald J. Yusko
Attorney, Agent, or Firm—Head & Johnson

[57] **ABSTRACT**

A digital data radio transmission system, such as may be used in communicating point-to-point by radio, in which a keyboard is used to insert a multi-decimal-digit number representing the called station. This is fed to a decimal-to-binary converter, forming a train of binary bits which are then coded in a selected manner so as to be substantially noise immune. The output of the coder then goes to the radio transmitter. At the receiving end, a similar means is provided for obtaining and storing in a 24-bit register the selected number of the called station. The output of the radio detector is then decoded to obtain the 24-bit word representing the called station, which is stored in a second register. A comparator compares the numbers stored in the two registers. When they compare positively, an alarm signal is enabled, or the receiver squelch is broken.

9 Claims, 5 Drawing Figures



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United States Patent [19]
Halpern et al.

[11] **4,383,322**
[45] **May 10, 1983**

[54] **COMBINED USE OF PN SEQUENCE FOR DATA SCRAMBLING AND FRAME SYNCHRONIZATION IN DIGITAL COMMUNICATION SYSTEMS**

[75] Inventors: **Peter H. Halpern**, Longwood; **James W. Toy**; **Charles R. Patisaul**, both of Melbourne, all of Fla.

[73] Assignee: **Harris Corporation**, Melbourne, Fla.

[21] Appl. No.: **146,338**

[22] Filed: **May 2, 1980**

[51] **Int. Cl.**³ **H04K 1/02**; H04B 15/00; H04L 7/08

[52] **U.S. Cl.** ..... **375/1**; 179/1.5 R; 375/2.1; 375/112

[58] **Field of Search** ..... 370/102, 107, 68, 109, 370/110.1, 111; 179/1.5 R, 1.5 S, 1.5 M, 1.5 E, 455/26, 30; 375/1, 112, 114, 115, 2.1, 2.2, 178/22.11-22.19, 22.01

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,873,773	3/1975	Guy, Jr.	370/102
3,931,473	1/1976	Ferris, Jr.	370/102
4,045,613	8/1977	Walker	375/112
4,052,565	10/1977	Baxter et al.	179/1.5 S
4,151,373	4/1979	Widmer et al.	370/111
4,171,513	10/1979	Otey et al.	375/106
4,221,931	9/1980	Seiler	179/1.5 S
4,305,152	12/1981	Asakawa et al.	178/22.17

Primary Examiner—Benedict V. Safourek
Attorney, Agent, or Firm—Antonelli, Terry & Wands

[57] **ABSTRACT**

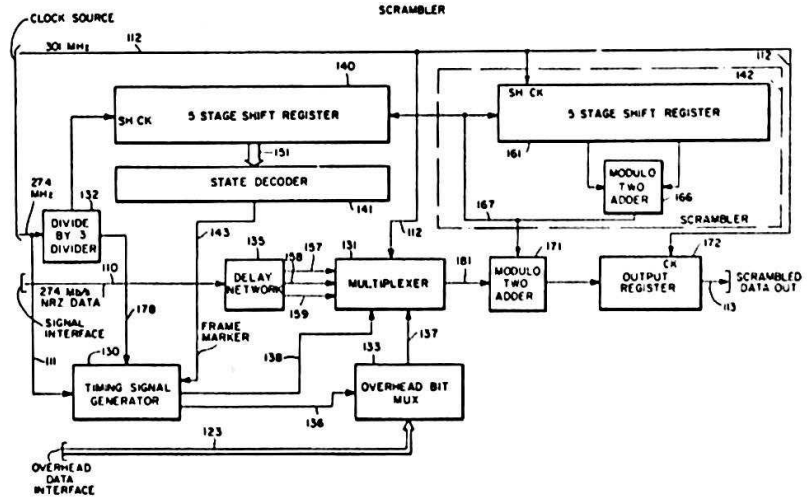
In a communication system containing a scheme for externally synchronizing and scrambling digital data signals, serial digital data signals to be transmitted are subdivided into prescribed numbers or sets between which additional or overhead bits are inserted, the resulting sequence being summed in a modulo-two adder with a multi-bit maximal length PN sequence, so that one of the overhead bits is one of the bits of the maximal length scrambling sequence.

A multiplexing operation yields a higher data rate sequence which is then modulo-two added with the output of a scrambler and transmitted.

At the receiver station, the incoming scrambled sequence is applied to timing recovery circuitry including a local framing sequence generator. The framing sequence is located and the stages of a separate shift register, which forms part of a descrambler PN sequence generator, are forced to a state which is coincident with the frame marker. This shift register is clocked at the incoming data rate by the recovered clock from a timing recovery circuitry and its output is modulo-two added with the incoming digital data stream, thereby recovering the original multiplexed data.

In order to recover the original data, the descrambled sequence is applied to a demultiplexer which effectively deletes every overhead bit and outputs the original data at the original data rate.

51 Claims, 7 Drawing Figures



5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT, SECRET COMMUNICATION AND MULTILEVEL SYSTEMS

ACTIVITY SUMMARY

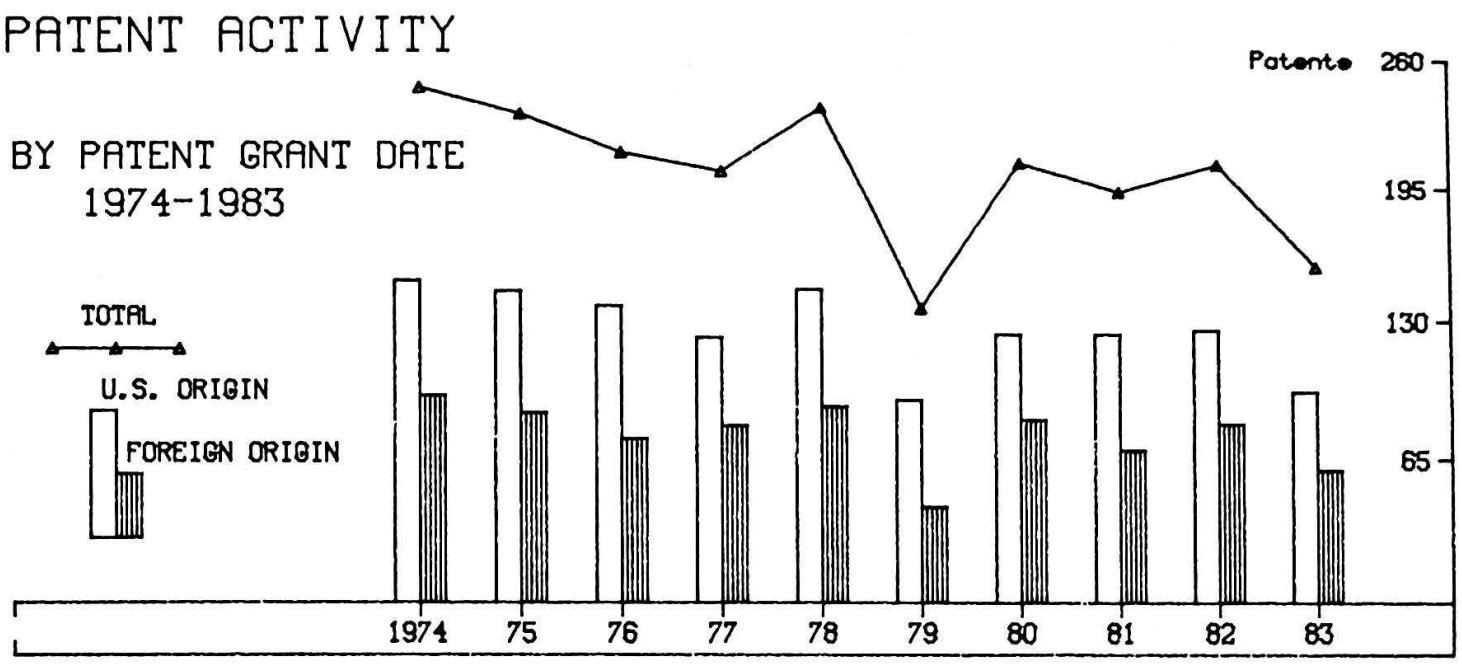
ACTIVITY INDICES (1981 - 1983)

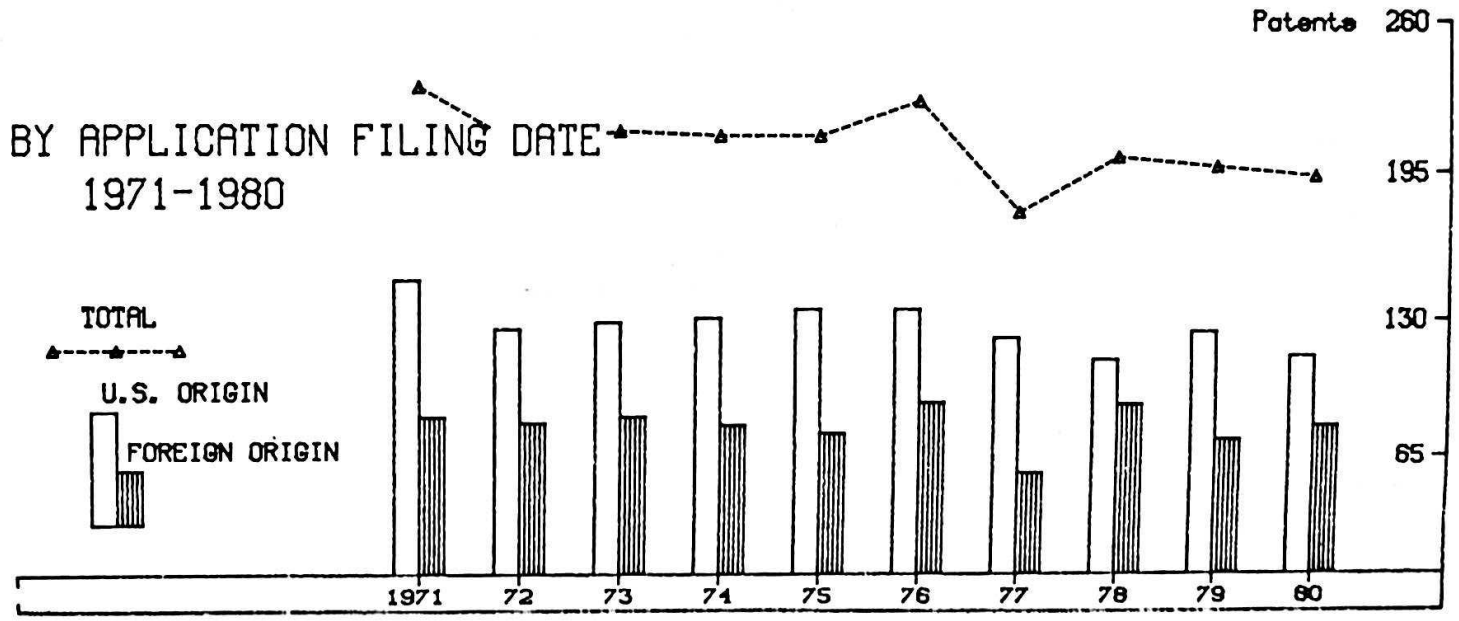
3-YEAR/10-YEAR SHARE	27.6%
FOREIGN SHARE	37.9%
CORPORATE OWNED	86.6%
GOVERNMENT OWNED	4.3%
U.S. OWNED OF FOREIGN	16.2%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 178, Subclasses 1-69.6 (including 116,117) 74-78, 111-115

Class 375, Subclasses 1-2.2, 6, 17-58, 121





5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT, SECRET COMMUNICATION AND MULTILEVEL SYSTEMS

ORGANIZATIONS ASSIGNED 9 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
259	BELL TELEPHONE LABORATORIES, INC.
212	INTERNATIONAL BUSINESS MACHINES CORP.
150	SIEMENS AG.
99	U.S. PHILIPS CORP.
74	INTERNATIONAL STANDARD ELECTRIC CORP.
70	NIPPON ELECTRIC CO., LTD.
53	UNITED STATES OF AMERICA, NAVY
53	XEROX CORP.
48	MOTOROLA INC.
44	BURROUGHS CORP.
44	RCA CORP.
42	TELETYPE CORP.
39	GENERAL ELECTRIC CO.
39	SPERRY CORP.
35	UNITED STATES OF AMERICA, ARMY
32	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
30	FUJITSU LTD.
26	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
26	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
26	NCR CORP.
23	OLIVETTI, INC. C., & C. S.P.A.
23	UNITED STATES OF AMERICA, AIR FORCE
22	HONEYWELL INC.
22	TELEFONAKTIEBOLAGET LM ERICSSON
21	WESTINGHOUSE ELECTRIC CORP.
20	COMMUNICATIONS SATELLITE CORP.
19	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
19	ROCKWELL INTERNATIONAL CORP.
18	BENDIX CORP.
18	TEXAS INSTRUMENTS, INC.
17	HARRIS CORP.
17	HONEYWELL INFORMATION SYSTEMS INC.
17	KOKUSAI DENSHIN DENWA K.K.
17	UNITED STATES OF AMERICA, NASA
16	DATOTEK, INC.
16	HUGHES AIRCRAFT CO.
16	SCM CORP.
15	NORTHERN TELECOM LTD.
15	SINGER CO.
14	COLLINS RADIO CO.
14	DE STAAT DER NEDERLANDEN, TE DEZEN VERTEGENWOORDIGD DOOR DE
13	MILGO ELECTRONIC CORP.
13	LICENTIA PATENT-VERWALTUNGS-GMBH
12	ANSTALT EUROPAISCHE HANDELSGESELLSCHAFT
12	GENERAL DYNAMIC CORP.
12	NATIONAL RESEARCH DEVELOPMENT CORP.
12	RAYTHEON CO.
11	BUNKER RAMO CORP.
11	HEWLETT-PACKARD CO.
11	HITACHI, LTD.
11	PATELHOLD PATENTVERWERTUNGS- & ELEKTRO-HOLDING AG.
11	SANDERS ASSOCIATES INC.
11	THOMSON-CSF
10	MARCONI CO. LTD.
10	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
10	TALOS SYSTEMS INC.
9	GRETAG AG.
9	GTE SYLVANIA INC.
9	RICOH CO., LTD.
9	TRW INC.

5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1267	236	333	277	250	242	229	210	201	233	135	206	192	206	156	4373
U.S. ORIGIN	995	157	233	190	163	148	143	136	121	144	92	123	123	125	96	2989
FOREIGN ORIGIN	272	79	100	87	87	94	86	74	80	89	43	83	69	81	60	1384
JAPAN	34	7	18	9	23	21	26	20	20	29	10	21	17	21	20	296
WEST GERMANY	55	15	21	18	17	17	19	16	16	16	14	23	11	21	7	286
UNITED KINGDOM	43	19	18	13	8	15	11	11	8	13	4	13	14	5	9	204
FRANCE	39	9	12	13	17	19	9	6	8	5	3	10	10	15	11	186
NETHERLANDS	33	9	10	4	9	6	2	4	8	10	1	8	6	5	2	117
SWITZERLAND	18	7	5	7	6	7	3	4	4	8	7	2	3	4	3	88
CANADA	10	3	4	3	1	3	9	6	6	4	1	1	1		5	57
SWEDEN	12	3	2	4	3	4		5	4	1	1	2	3	4	2	50
ITALY	11	3	6	11		1	4	1	3	2	1	2	1	3		49
BELGIUM	5	1	1	2	1		1		1					1		13
NORWAY	5	3	2	1	1											12
AUSTRALIA	2							1	1	1			1			6
ISRAEL							2					1		1	1	5
SOUTH KOREA														1		1
AUSTRIA									1							1
YUGOSLAVIA											1					1
HONG KONG													1			1
EGYPT	1															1
FINLAND			1													1
DENMARK	1															1
ICELAND				1												1
INDONESIA	1															1
GREECE					1											1
SINGAPORE				1												1
LUXEMBOURG													1			1
S. AFRICA	1															1
BURMA	1															1
U.S.S.R.						1										1
U.S. ORIGIN	995	157	233	190	163	148	143	136	121	144	92	123	123	125	96	2989
U.S. CORP. OWNED	871	136	199	161	138	123	116	119	101	117	74	95	101	103	88	2542
U.S. GOVT. OWNED	43	10	15	11	9	10	13	8	9	12	3	11	7	5	3	169
U.S. INDIV. OWNED	80	10	17	18	16	15	13	8	10	14	15	16	10	15	5	262
FOREIGN OWNED	1	1	2				1	1	1	1		1	5	2		16
FOREIGN ORIGIN	272	79	100	87	87	94	86	74	80	89	43	83	69	81	60	1384
U.S. OWNED	66	26	18	18	22	27	15	10	13	19	4	17	14	14	6	289
FOREIGN OWNED	206	53	82	69	65	67	71	64	67	70	39	66	55	67	54	1095
FOREIGN CORP.	175	47	70	60	64	59	63	57	60	69	33	58	48	56	45	964
FOREIGN GOVT.	11		5			1	1	1	1		1	1	2	3	2	29
FOREIGN INDIV.	20	6	7	9	1	7	7	6	6	1	5	7	5	8	7	102

5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1379	214	231	206	212	210	210	225	177	201	197	193	98	7		3760
U.S. ORIGIN	990	152	147	125	128	130	134	134	121	111	124	113	57	5		2471
FOREIGN ORIGIN	389	62	84	81	84	80	76	91	56	90	73	80	41	2		1289
JAPAN	45	14	19	20	23	22	16	31	16	21	18	25	11	2		283
WEST GERMANY	86	7	24	19	9	18	18	17	13	24	11	17	7			270
UNITED KINGDOM	68	13	6	15	11	8	10	12	6	16	12	7	7			191
FRANCE	54	12	8	16	15	4	9	7	3	10	12	17	7			174
NETHERLANDS	39	2	8	3	7	5	6	8	2	8	7	5	2			102
SWITZERLAND	28	4	7	2	6	4	3	11	4	4	4	2	1			80
CANADA	12	2	2	1	8	8	6	2	5	1		2	3			52
SWEDEN	13	2	3	3	1	5	3	1	2	5	3	2	1			44
ITALY	22	4	4		3	2	3	1	3	1	3	1				47
BELGIUM	6	1	2		1		1					1				12
NORWAY	9	1		1												11
AUSTRALIA	2					2			1		1					6
ISRAEL						2		1					2			5
SOUTH KOREA												3				3
AUSTRIA							1									1
YUGOSLAVIA									1							1
HONG KONG											1					1
EGYPT	1															1
FINLAND	1															1
DENMARK																
ICELAND	1															1
INDONESIA	1															1
GREECE			1													1
SINGAPORE	1															1
LUXEMBOURG											1					1
S. AFRICA																
BURMA																
U.S.S.R.				1									2			3
U.S. ORIGIN	990	152	147	125	128	130	134	134	121	111	124	113	57	5		2471
U.S. CORP. OWNED	842	134	122	103	104	113	116	109	100	95	101	97	50	5		2091
U.S. GOVT. OWNED	67	8	13	5	9	9	7	10	5	2	5	4	3			147
U.S. INDIV. OWNED	77	10	12	17	15	7	10	13	15	12	15	10	4			217
FOREIGN OWNED	4					1	1	2	1	2	3	2				16
FOREIGN ORIGIN	389	62	84	81	84	80	76	91	56	90	73	80	41	2		1289
U.S. OWNED	90	16	16	21	22	14	11	18	6	18	17	11	7			267
FOREIGN OWNED	299	46	68	60	62	66	65	73	50	72	56	69	34	2		1022
FOREIGN CORP.	264	41	65	57	53	58	58	70	44	64	47	59	28	2		910
FOREIGN GOVT.	10	1	1		2	1	1			1	1	4	2			24
FOREIGN INDIV.	25	4	2	3	7	7	6	3	6	7	8	6	4			88

5.3 DIGITAL AND PULSE COMMUNICATIONS: PARTICULAR MODULATION TECHNIQUES, SYSTEMS USING ALTERNATING OR PULSATING CURRENT, SECRET COMMUNICATION AND MULTILEVEL SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1768
TOTAL REFERENCES CITED	10661
U.S. Patent References Cited	9686
Foreign Patent References Cited	281
Other References Cited	694

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	6064
Japan	613
United Kingdom	345
West Germany	325
France	308

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,956,615, International Business Machines Corp.	20
3,958,081, International Business Machines Corp.	18
3,657,699, International Business Machines Corp.	16
3,962,539, International Business Machines Corp.	15
3,798,359, International Business Machines Corp.	15

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	691
International Business Machines Corp.	622
U.S. Philips Corp.	172
Nippon Electric Co., Ltd.	161
International Standard Electric Corp.	127

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

DEFINITION

This profile includes apparatus and processes for the detection and/or correction of errors in pulse or pulse coded information. An error is defined as any change in the information content of pulse coded data to a state or value other than the desired content. Also included are testing systems other than error related testing, and synchronization apparatus and processes.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 5.4 are:

U.S. Patent 4,321,704. This patent shows an error checking system using parity bits. It is designed for use in digital video recording systems as well as communication systems.

U.S. Patent 4,349,904. This invention is an error checking and correction system for teletext systems.

U.S. Patent 4,422,171. This patent shows an error checking system suitable for use in satellite systems transmitting bulk data between distant points. It is an example of transmit-acknowledge error checking systems.

U.S. Patent 4,428,076. This patent shows a transmission line testing scheme which uses a standard pseudorandom bit pattern.

United States Patent [19]

Lemoine

[11] **4,321,704**

[45] **Mar. 23, 1982**

[54] **PARITY CHECKING CIRCUITRY FOR USE IN MULTI-BIT CELL PCM RECORDING AND REPRODUCING APPARATUS**

[75] Inventor: **Maurice G. Lemoine, Redwood City, Calif.**

[73] Assignee: **Ampex Corporation, Redwood City, Calif.**

[21] Appl. No.: **117,745**

[22] Filed: **Feb. 1, 1980**

[51] **Int. Cl.**³ **G06F 11/10**

[52] **U.S. Cl.** **371/51; 371/37**

[58] **Field of Search** 371/49, 50, 51, 37

[56] **References Cited**

U.S. PATENT DOCUMENTS

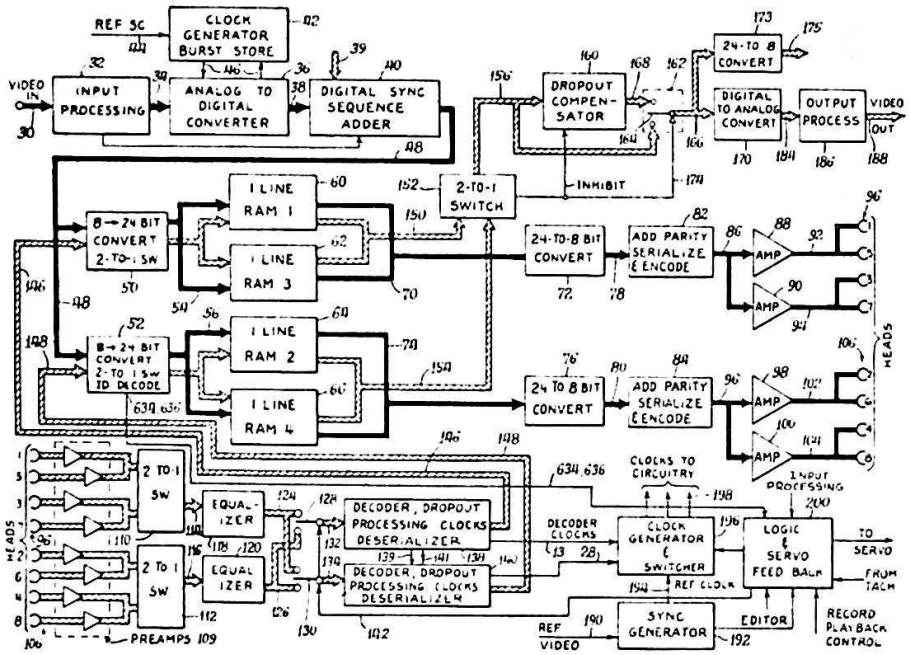
3,037,697	6/1962	Kahn	371/50
3,387,261	6/1968	Betz	371/50
3,601,798	8/1971	Hsiao	371/37
3,634,821	1/1972	Bossen et al.	371/37
3,831,144	8/1974	En	371/50
3,876,978	4/1975	Bossen et al.	371/51
4,016,409	4/1977	Kim	371/51
4,044,328	8/1977	Herff	371/50
4,211,997	7/1980	Rudnick et al.	371/51

Primary Examiner—Charles E. Atkinson
Attorney, Agent, or Firm—Roger D. Greer, Robert G. Clay; Joel D. Talcott

[57] **ABSTRACT**

A method and apparatus for detecting errors in the accuracy of multi-bit data words, i.e., a parity method and apparatus, is disclosed. The invention is intended for use in determining the accuracy of multi-bit data words that are being transmitted through a communication channel or are being recorded and reproduced using magnetic recording or other technique. One embodiment of the invention involves examining at least three significant bits in at least three successive words and generating parity bits with predetermined logical states determined by the content of the examined significant bits and combining one of the parity bits with each of the data words for transmission or recording and subsequently examining the data words and parity bits upon receipt and generating an error signal for the data words when one of the parity bits combined with the examined data words has a logical state other than that that would have been transmitted or recorded if determined by the original content of the received data words.

5 Claims, 45 Drawing Figures



United States Patent [19]

Janssen et al.

[11] **4,349,904**

[45] **Sep. 14, 1982**

[54] **ERROR CORRECTION CIRCUIT USING CHARACTER PROBABILITY**

[75] Inventors: **Peter J. H. Janssen; Wilhelmus J. Christis, both of Eindhoven, Netherlands**

[73] Assignee: **U.S. Philips Corporation, New York, N.Y.**

[21] Appl. No.: **141,546**

[22] Filed: **Apr. 18, 1980**

[30] **Foreign Application Priority Data**

Apr. 27, 1979 [NL] Netherlands 7903340

[51] **Int. Cl.**³ **G06F 11/14**

[52] **U.S. Cl.** **371/69; 371/31**

[58] **Field of Search** 371/69, 48, 31, 22

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,938,081	2/1976	Kirk	371/48
4,054,863	10/1977	Goodman et al.	371/31
4,224,689	9/1980	Sundberg	371/31 X

OTHER PUBLICATIONS

Stolz et al., "A Stochastic Approach to the Grammatical Coding of English", *Communications of the ACM*, vol. 8, No. 6, Jun., 1965, pp. 399-405.

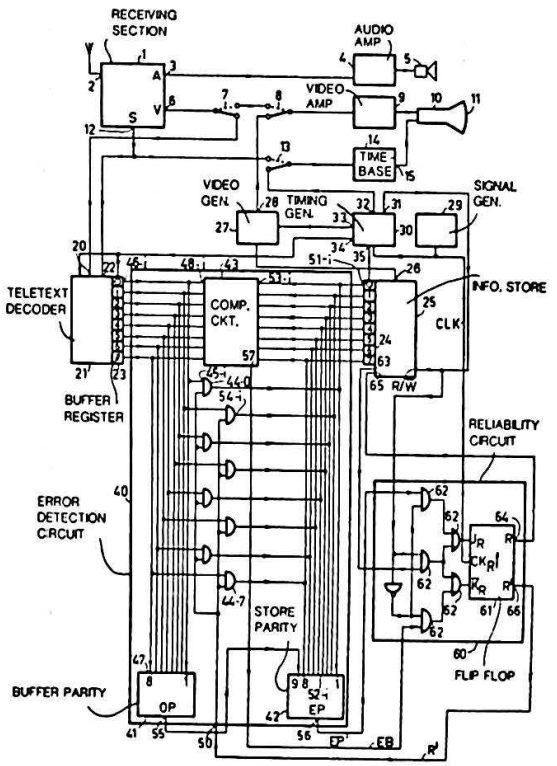
Primary Examiner—David H. Malzahn
Attorney, Agent, or Firm—Thomas A. Briody, William J. Streeter; Edward W. Goodman

[57] **ABSTRACT**

An error correction circuit in a television receiver for receiving, for example, Teletext information, Viewdata information or information of comparable systems. The codes representing symbol information received by the receiver are classified into one out of two or more classes in dependence on the frequency of their occurrence, this classification being an indication of the extent to which it is probable that a received code is correctly received.

In FIG. 1, a picture text television receiver has a receiving section, audio and video amplifiers 4 and 9 and a picture tube 10, 11. A text decoder 21 receives symbol information which is stored in a store 25 for display. An error detector circuit 40 including a comparison circuit 43 and two parity circuits 41 and 42, and checks for parity between newly received and already stored symbol information. A reliability circuit 60 is also included.

7 Claims, 2 Drawing Figures



United States Patent [19]
Wortley et al.
[11] 4,422,171
[45] Dec. 20, 1983

[54] METHOD AND SYSTEM FOR DATA COMMUNICATION

[75] Inventors: David L. Wortley; Kenneth N. Larson, both of Thousand Oaks, Calif.

[73] Assignee: Allied Corporation, Law Department, Morristown, N.J.

[21] Appl. No.: 221,058

[22] Filed: Dec. 29, 1980

[51] Int. Cl.³ G08C 25/02
[52] U.S. Cl. 371/32
[58] Field of Search 371/32, 33

[56] References Cited

U.S. PATENT DOCUMENTS

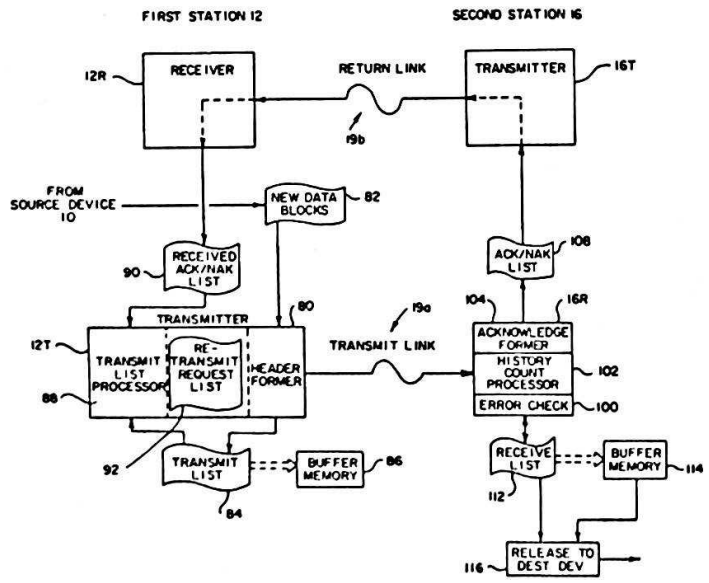
3,381,272	4/1968	Pasini	371/32
3,676,846	7/1972	Busch	371/33
3,876,979	3/1975	Winn et al.	371/32
3,979,719	9/1976	Tooley et al.	371/32
4,149,142	4/1979	Kageyama et al.	371/32
4,237,338	12/1980	Hecht	371/32

Primary Examiner—Charles E. Atkinson
Attorney, Agent, or Firm—Joel I. Rosenblatt

[57] ABSTRACT

A method and system for communicating digital data particularly adapted for transferring large amounts of bulk data from a first station to a second station over a long propagation delay path, as for example, between first and second earth stations via a satellite repeater. The system implements a procedure or protocol which is characterized by causing the source station to continuously transmit data frames at fixed intervals, each such data frame including an identification number and an information field, generally containing a portion of a user data record. Error checking means at the destination station determines whether the data frames received thereat are error free. The destination station also continuously transmits data frames at fixed intervals substantially synchronized with the source station data frame intervals. Each data frame transmitted by the destination station may include a source station identification number and a positive or negative acknowledgement to indicate whether or not the identified source station data frame was correctly received by the destination station. The source station then interprets the destination station data frame to determine whether it is necessary to retransmit any previously transmitted data frames.

14 Claims, 10 Drawing Figures



United States Patent [19]
Schuon
[11] 4,428,076
[45] Jan. 24, 1984

[54] METHOD OF AND SYSTEM FOR EVALUATING BIT ERRORS IN TESTING A SIGNAL PATH

[75] Inventor: Eberhard Schuon, Eningen, Fed. Rep. of Germany

[73] Assignee: Wandel & Goltermann GmbH & Co., Eningen, Fed. Rep. of Germany

[21] Appl. No.: 330,719

[22] Filed: Dec. 14, 1981

[30] Foreign Application Priority Data

Dec. 16, 1980 [DE] Fed. Rep. of Germany 3047239

[51] Int. Cl.³ H04B 17/00; H04L 1/00
[52] U.S. Cl. 371/5; 371/22; 375/10
[58] Field of Search 371/5, 22, 25; 375/10

[56] References Cited

U.S. PATENT DOCUMENTS

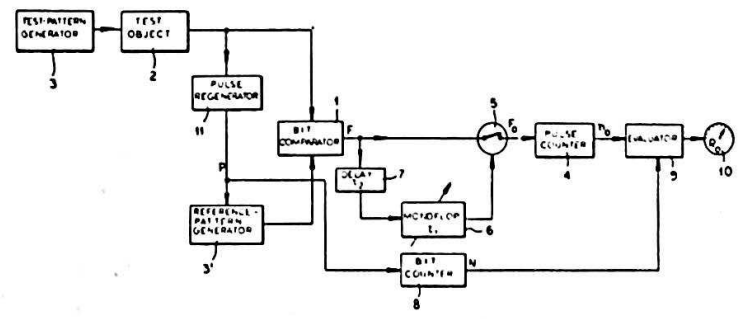
4,070,647	1/1978	Robson	371/5
4,363,123	12/1982	Grover	371/5
4,385,383	5/1983	Karchevski	371/5
4,387,461	6/1983	Evans	371/5
4,393,499	7/1983	Evans	371/5

Primary Examiner—Charles E. Atkinson
Attorney, Agent, or Firm—Karl F. Ross

[57] ABSTRACT

In order to evaluate the fidelity of a transmission line or other test object, a pseudorandom bit pattern is fed to the input end of that test object and is compared bit by bit with the pattern exiting at its output end. Since independent transmission errors are considered particularly relevant for this evaluation, in contrast to consequential errors following an initial error within a predetermined number of bit cycles, an error pulse emitted by the bit comparator causes the blocking of further error pulses for a selected time interval. The blocking may be effected by a retriggerable monoflop of adjustable off-normal period or by a presettable down counter.

12 Claims, 5 Drawing Figures



5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

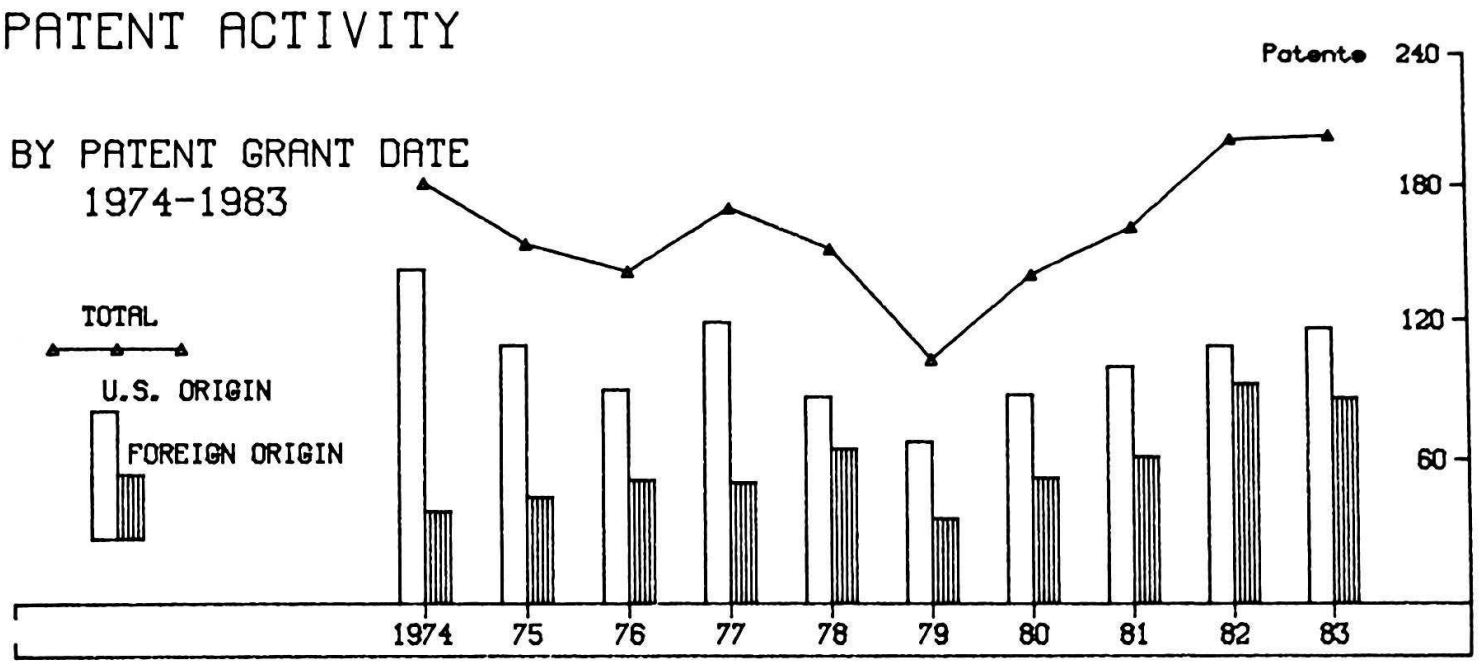
ACTIVITY SUMMARY

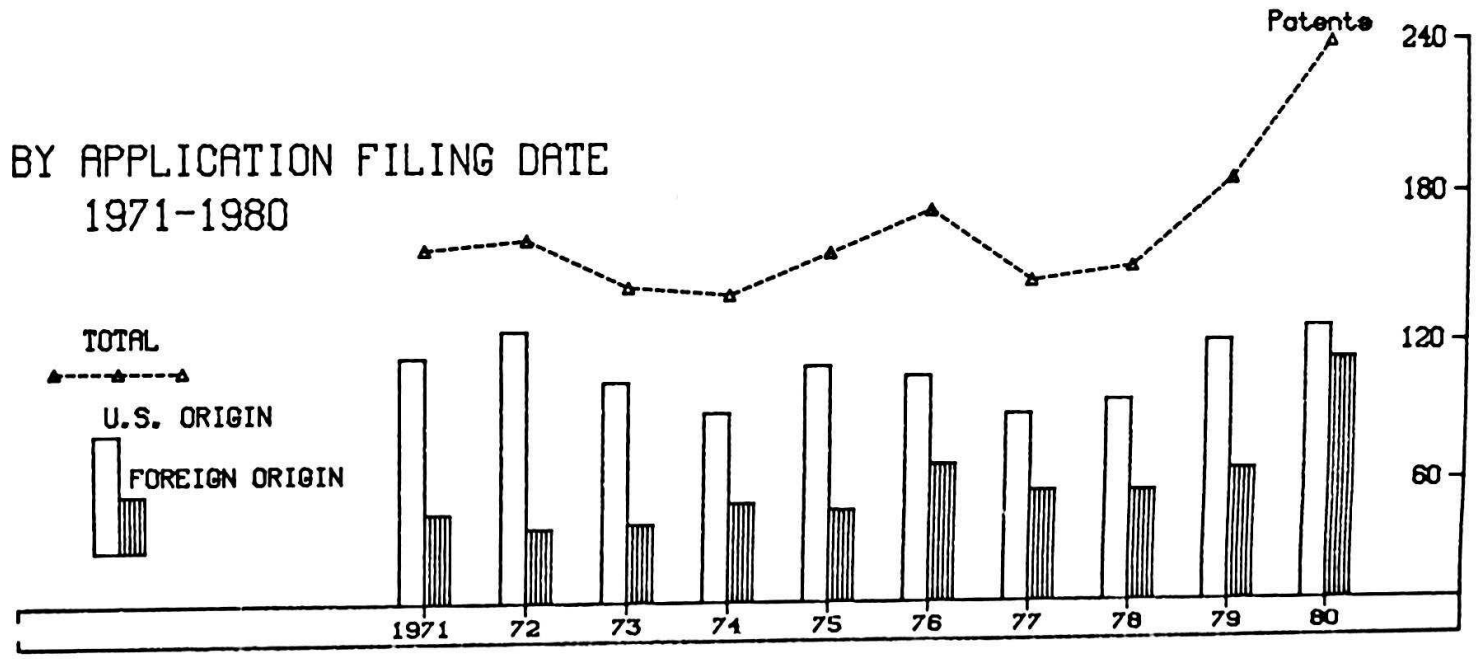
ACTIVITY INDICES (1981 - 1983)	
3-YEAR/10-YEAR SHARE	35.3%
FOREIGN SHARE	42.5%
CORPORATE OWNED	94.8%
GOVERNMENT OWNED	2.7%
U.S. OWNED OF FOREIGN	14.2%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 371, Subclasses 1-6, 30-71

Class 375, Subclasses 10, 106-120





5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

ORGANIZATIONS ASSIGNED 7 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
210	INTERNATIONAL BUSINESS MACHINES CORP.
180	BELL TELEPHONE LABORATORIES, INC.
81	SIEMENS AG.
67	HONEYWELL INFORMATION SYSTEMS INC.
57	U.S. PHILIPS CORP.
56	MOTOROLA INC.
54	UNITED STATES OF AMERICA, NAVY
48	GENERAL ELECTRIC CO.
48	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
46	BURROUGHS CORP.
46	SPERRY CORP.
45	INTERNATIONAL STANDARD ELECTRIC CORP.
44	NIPPON ELECTRIC CO., LTD.
41	ROCKWELL INTERNATIONAL CORP.
34	RCA CORP.
33	UNITED STATES OF AMERICA, NASA
30	COMMUNICATIONS SATELLITE CORP.
28	FUJITSU LTD.
28	NCR CORP.
28	SONY CORP.
27	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
26	TELEFONAKTIEBOLAGET LM ERICSSON
24	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
23	BENDIX CORP.
22	HONEYWELL INC.
21	HITACHI, LTD.
21	WESTINGHOUSE ELECTRIC CORP.
19	XEROX CORP.
18	TOKYO SHIBAURA ELECTRIC CO., LTD.
17	HARRIS CORP.
15	KOKUSAI DENSHIN DENWA K.K.
14	LICENTIA PATENT-VERWALTUNGS-GMBH
14	UNITED STATES OF AMERICA, ARMY
13	TEXAS INSTRUMENTS, INC.
12	DE STAAT DER NEDERLANDEN, TE DEZEN VERTEGENWOORDIGD DOOR DE
12	THOMSON-CSF
12	UNITED STATES OF AMERICA, AIR FORCE
11	COLLINS RADIO CO.
11	GENERAL DYNAMICS CORP.
11	GENERAL SIGNAL CORP.
11	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
10	ALLEN-BRADLEY CO.
10	CSELT - CENTRO STUDI E LABORATORI TELECOMUNICAZIONI S.P.A.
10	GTE SYLVANIA INC.
10	POST OFFICE
9	AMPEX CORP.
9	MARTIN-MARIETTA CORP.
9	NORTHERN TELECOM LTD.
8	CODEX CORP.
8	FORD AEROSPACE & COMMUNICATIONS CORP.
8	HEWLETT-PACKARD CO.
8	MARCONI CO., LTD.
8	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
8	PLESSEY HANDEL UND INVESTMENTS AG.
8	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
8	TELETYPE CORP.
8	TRW INC.
7	COMPAGNIE INTERNATIONALE POUR L'INFORMATIQUE CII-HONEYWELL
7	SINGER CO.
7	UNITED TECHNOLOGIES CORP.

5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	645	162	198	164	172	179	152	140	168	150	102	139	160	200	202	2933
U.S. ORIGIN	516	126	145	124	119	141	108	89	118	86	67	87	99	108	116	2049
FOREIGN ORIGIN	129	36	53	40	53	38	44	51	50	64	35	52	61	92	86	884
JAPAN	13	8	11	9	13	7	10	12	16	16	15	15	22	34	36	237
WEST GERMANY	26	7	7	14	13	10	8	9	11	11	5	11	13	16	19	180
UNITED KINGDOM	23	6	14	8	9	6	7	7	9	14	4	6	11	5	11	140
FRANCE	21	5	6	2	9	9	9	8	7	8	4	10	8	17	8	131
NETHERLANDS	24	5	5	5	6	3		3		3		1	4	9	5	73
SWEDEN	7	2	1	1		1	2	4	3	4	2	3		2	2	34
ITALY	3		3		1		1	4	3	4	1	3	1	5	1	30
CANADA	5	1	2	1	2		3	2	1		2			3	2	24
SWITZERLAND	2	1				1	2	1		3	1	2			1	14
BELGIUM	3	1	2							1			2		1	10
NORWAY	1						1					1				3
CZECHOSLOVAKIA			1			1										2
EAST GERMANY							1									1
HONG KONG								1								1
IRAN	1															1
ISRAEL											1					1
DENMARK														1		1
U.S.S.R.			1													1
U.S. ORIGIN	516	126	145	124	119	141	108	89	118	86	67	87	99	108	116	2049
U.S. CORP. OWNED	480	107	135	110	105	118	97	80	105	76	63	78	89	102	106	1851
U.S. GOVT. OWNED	22	17	10	9	9	17	9	4	7	3	3	2	6	1	4	123
U.S. INDIV. OWNED	14	1		4	5	6	2	5	6	7	1	6	2	4	4	67
FOREIGN OWNED		1		1								1	2	1	2	8
FOREIGN ORIGIN	129	36	53	40	53	38	44	51	50	64	35	52	61	92	86	884
U.S. OWNED	48	9	12	12	21	7	8	8	2	9	3	6	9	11	14	179
FOREIGN OWNED	81	27	41	28	32	31	36	43	48	55	32	46	52	81	72	705
FOREIGN CORP.	70	26	40	28	31	30	34	39	43	48	30	42	50	79	69	659
FOREIGN GOVT.	7	1					1	1	1	3	2		1	1	1	19
FOREIGN INDIV.	4		1		1	1	1	3	4	4		4	1	1	2	27

5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	707	130	156	160	141	138	155	172	144	150	185	239	118	6		2601
U.S. ORIGIN	535	94	112	123	102	89	109	105	89	95	120	126	67	2		1768
FOREIGN ORIGIN	172	36	44	37	39	49	46	67	55	55	65	113	51	4		833
JAPAN	31	6	14	5	5	12	13	20	22	16	18	46	23	2		233
WEST GERMANY	32	10	8	14	9	6	11	13	7	12	15	21	8	1		167
UNITED KINGDOM	36	8	5	7	6	8	7	15	7	7	11	7	8			132
FRANCE	25	4	10	4	11	8	5	6	10	10	12	17	4			126
NETHERLANDS	24	4	5	4	1	1	3	2		1	4	11	3			63
SWEDEN	7	1		1	2	4	3	3	2	3	1	3	1			31
ITALY	5			1	1	2	3	5	2	3	1	4	2			29
CANADA	4	3	2		2	3	1		2		1	3	1			22
SWITZERLAND	2				1	3		3	1	2				1		13
BELGIUM	4								1		2		1			8
NORWAY						1				1						2
CZECHOSLOVAKIA	1			1												2
EAST GERMANY					1											1
HONG KONG						1										1
IRAN									1							1
ISRAEL												1				1
DENMARK													2			3
U.S.S.R.	1															
U.S. ORIGIN	535	94	112	123	102	89	109	105	89	95	120	126	67	2		1768
U.S. CORP. OWNED	472	85	100	106	86	82	101	92	81	86	111	118	61	1		1582
U.S. GOVT. OWNED	51	5	7	13	12	4	4	7	3	4	3	2	2	1		118
U.S. INDIV. OWNED	10	4	5	4	4	3	4	5	5	4	5	5	2			60
FOREIGN OWNED	2							1		1	1	1	2			8
FOREIGN ORIGIN	172	36	44	37	39	49	46	67	55	55	65	113	51	4		833
U.S. OWNED	44	13	12	12	6	9	6	8	4	5	10	14	9	2		154
FOREIGN OWNED	128	23	32	25	33	40	40	59	51	50	55	99	42	2		679
FOREIGN CORP.	118	23	31	25	30	37	36	53	47	45	53	94	42	2		636
FOREIGN GOVT.	6				1	1		3	2	1	1	2				17
FOREIGN INDIV.	4		1		2	2	4	3	2	4	1	3				26

5.4 DIGITAL AND PULSE COMMUNICATIONS: ERROR CHECKING AND CORRECTION INCLUDING TESTING AND SYNCHRONIZATION

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1413
TOTAL REFERENCES CITED	9722
U.S. Patent References Cited	8981
Foreign Patent References Cited	182
Other References Cited	559

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	5485
Japan	483
United Kingdom	328
France	307
West Germany	285

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,517,174, Telefonaktiebolaget LM Ericsson	18
3,988,677, Unassigned	15
3,721,959, Collins Radio Co.	15
3,851,306, International Business Machines Corp.	14
4,206,440, Sony Corp.	13

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
International Business Machines Corp.	678
Bell Telephone Laboratories, Inc.	570
Honeywell Information Systems Inc.	177
Motorola Inc.	156
Sperry Corp.	137

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

5.5 PULSE AND DIGITAL COMMUNICATIONS: CODE CONVERSION

DEFINITION

This profile includes apparatus and techniques for translating one code into another, especially systems for converting analog codes to digital codes and vice versa. Also included are digital communications apparatus which are convertible to analog operation. Other code convertors covered include: digital-to-digital convertors, synchro convertors, reversible convertors, integrating convertors, and convertors with sample hold functions.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 5.5 are:

U.S. Patent 4,350,973. This patent is an example of a digital-to-digital code convertor.

U.S. Patent 4,369,434. This patent shows a transmitting and receiving system for secret codes which is intended to minimize manual input by the operator.

U.S. Patent 4,387,366. This patent shows a system for expanding the amount of information which can be included in an eight-bit binary code signal.

U.S. Patent 4,404,544. This invention is a coding scheme for binary data which facilitates conversion from bipolar code to binary code. Such a conversion is required, for example, when bipolar coded data on an electric cable are transferred onto an optic link which can only transmit binary coded data.

United States Patent [19]

Petryk, Jr.

[11] **4,350,973**

[45] **Sep. 21, 1982**

[54] **RECEIVER APPARATUS FOR CONVERTING OPTICALLY ENCODED BINARY DATA TO ELECTRICAL SIGNALS**

[75] Inventor: **Edward M. Petryk, Jr., Phoenix, Ariz.**

[73] Assignee: **Honeywell Information Systems Inc., Phoenix, Ariz.**

[21] Appl. No.: **59,879**

[22] Filed: **Jul. 23, 1979**

[51] **Int. Cl.**³ **H03K 13/00**

[52] **U.S. Cl.** ..... **340/347 DD**; 360/42

[58] **Field of Search** ..... 350/96.1; 360/42, 43; 340/347 DD

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,727,202	4/1973	Fort	360/42
3,795,903	3/1974	Lindsey	360/42
3,925,727	12/1975	Duguay	250/227 X
3,979,746	9/1976	Jarrett	360/42 X
4,137,451	1/1979	Einolf, Jr.	340/347 P X

OTHER PUBLICATIONS

The Engineering Staff of Analog Devices, Inc., Analog-Digital Conversion Handbook, 6/1972, pp. I-2,3; I-8,9; II-44,45; II-80,81.

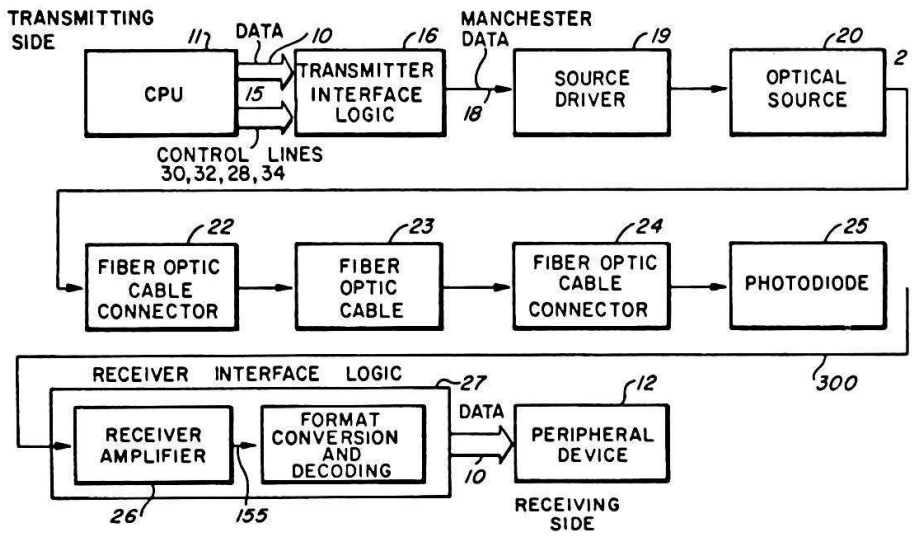
Primary Examiner—Thomas J. Sloyan

Attorney, Agent, or Firm—W. W. Holloway, Jr.; N. Prasinos; L. J. Marhoefer

[57] **ABSTRACT**

An apparatus for receiving optically encoded binary data transmitted over an optical fiber from an optical transmitter device coupled to another data processing system. The receiver apparatus is used to convert the light signal carrying the subject data into TTL level digital logic signals. The receiver apparatus is comprised of circuitry for converting the optically encoded data into electrical signals in serial format, and circuitry for converting these electrical signals into TTL level digital signals in parallel format for use by a user device. The primary advantage of the apparatus disclosed here is the ability to substitute a single optical fiber for a plurality of parallel copper wires for carrying data between one data processing device and another with little or no loss in speed due to the larger bandwidth of optical fibers. Another significant advantage is the ability to couple data processing systems directly over much larger distances than possible with average cost parallel copper wire electrical cables. Higher noise immunity and communications security is also enjoyed. In the preferred embodiment, the receiver apparatus comprises a photodiode for converting the light signal into an electrical signal followed by an amplifier for changing the electrical signal to TTL digital logic levels. A clock generator and header detector recover a clock signal and detect the receipt of a header signal indicating transmission of a serial format data packet has commenced. A serial in and parallel out shift register/data latch storage buffer combination utilizes a signal derived from the recovered clock signal to shift the incoming data bits into the shift register and latch them into the data latch output buffers in parallel format when a counter signals that an entire data packet has been received.

2 Claims, 22 Drawing Figures



United States Patent [19]

Mueller

[11] **4,369,434**

[45] **Jan. 18, 1983**

[54] **ENCIPHERING/DECIPHERING SYSTEM**

[75] Inventor: **Kurt H. Mueller, Wallisellen, Switzerland**

[73] Assignee: **Gretag Aktiengesellschaft, Regensdorf, Switzerland**

[21] Appl. No.: **215,493**

[22] Filed: **Dec. 11, 1980**

[30] **Foreign Application Priority Data**

Dec. 20, 1979 [CH] Switzerland 11319/79

[51] **Int. Cl.**³ **H03K 13/00**

[52] **U.S. Cl.** ..... **340/347 DD**; 178/27.05; 178/22.06

[58] **Field of Search** ..... 364/717; 178/22.05, 178/22.06, 22.07, 22.08, 22.09, 22.19; 179/1.5 E, 1.5 S; 340/347 DD

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,796,830	3/1974	Smith	178/22.06
3,798,360	3/1974	Feistel	178/22.05
3,958,081	5/1976	Ehrsam	178/22.05
4,211,891	7/1980	Glitz	178/22.19
4,281,215	7/1981	Atalla	178/22.08

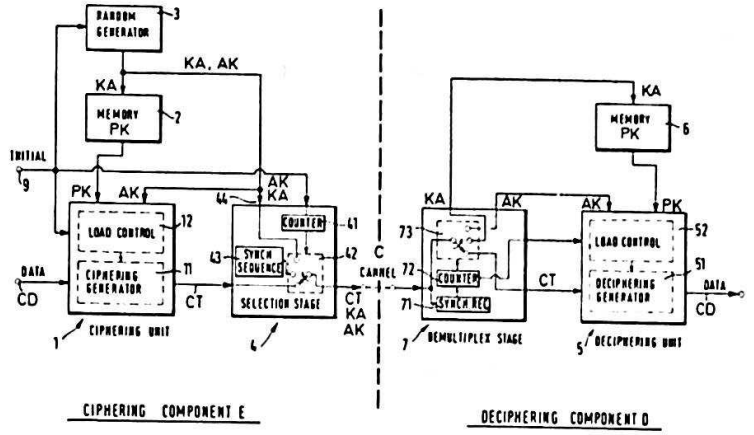
Primary Examiner—C. D. Miller

Attorney, Agent, or Firm—Burns, Doane, Swecker & Mathis

[57] **ABSTRACT**

The enciphering section of an enciphering/deciphering system includes a random number generator, a primary code memory and a multiplex unit in addition to the actual enciphering unit. The deciphering section includes a deciphering unit, a primary code memory and a demultiplex unit. At the beginning of each transmission, and after disturbances, the enciphering and deciphering sections are first synchronized by means of a synchronization sequence. Then a random address is produced by the random number generator for a primary code, and a randomly determined auxiliary code is also selected. The address and the auxiliary code are then transmitted and the primary and auxiliary codes are loaded into the enciphering and deciphering units. The randomly controlled, statistical selection of the primary code simplifies the code management and thus the operation of the system.

5 Claims, 7 Drawing Figures



United States Patent [19]

Chow

[11] **4,387,366**

[45] **Jun. 7, 1983**

[54] **CODE CONVERTER FOR POLARITY-INSENSITIVE TRANSMISSION SYSTEMS**

[75] Inventor: **Peter E. K. Chow, Nepean, Canada**

[73] Assignee: **Northern Telecom Limited, Montreal, Canada**

[21] Appl. No.: **319,190**

[22] Filed: **Nov. 9, 1981**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 157,479, Jun. 9, 1980, abandoned.

[51] Int. Cl.³ H04L 3/00

[52] U.S. Cl. ..... 340/347 DD; 375/19

[58] Field of Search ..... 340/347 DD; 375/19; 371/55, 56

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,302,193	1/1967	Sipress	340/347 DD
3,439,330	4/1969	Sipress	340/347 DD
3,587,088	6/1971	Franaszek	340/347 DD
3,611,141	10/1971	Waters	340/347 DD

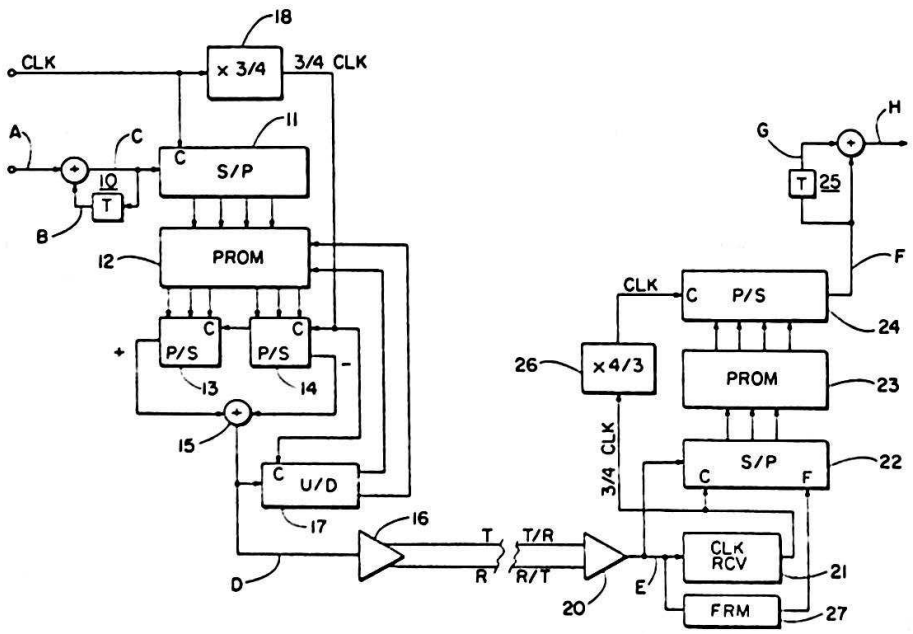
Primary Examiner—C. D. Miller

Attorney, Agent, or Firm—John E. Mowle

[57] **ABSTRACT**

A polarity-insensitive code converter in which blocks of binary digits are translated into multilevel words having either one mode or another mode so that each coded word of one block of binary digits is the inverse coded word of the block of inverse binary digits. Hence, the inversion of a code word during transmission results in the inversion of the recovered binary. With additional precoding and postcoding of the binary signal, polarity integrity of the original signal can always be restored.

3 Claims, 1 Drawing Figure



United States Patent [19]

Dwarakanath

[11] **4,404,544**

[45] **Sep. 13, 1983**

[54] **μ-LAW/A-LAW PCM CODEC**

[75] Inventor: **Mirmira R. Dwarakanath, Berkeley Heights, N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **252,600**

[22] Filed: **Apr. 9, 1981**

[51] Int. Cl.³ H03K 13/02; H03K 13/08

[52] U.S. Cl. ..... 340/347 AD; 340/347 C; 340/347 DA; 340/347 M

[58] Field of Search ..... 340/347 M, 347 C, 347 AD, 340/347 DA; 375/30, 25; 370/7

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,594,782	7/1971	Carbrey	340/347 DA
3,626,408	12/1971	Carbrey	340/347 AD
3,651,518	3/1972	Carbrey	340/347 AD
3,653,030	3/1972	Carbrey	340/347 AD
3,653,035	3/1972	Carbrey	340/347 C
3,745,555	7/1973	Carbrey	340/347 AD
4,231,022	10/1980	Kosugi et al.	340/347 DA

OTHER PUBLICATIONS

Members of the Technical Staff, Bell Telephone Labs, Transmission Systems for Communication, 1971, pp. 574-583

Tsividis et al., A Segmented U-255 Law PCM Voice Encoder—, IEEE Journal of Solid-State Circuits, vol. SC-11, No. 6, pp. 740-747.

Dwarakanath et al., A Two-Chip CMOS CODEC, International Conference on Communications, 1980 Conference Record, pp. 11.3.1-11.3.4.

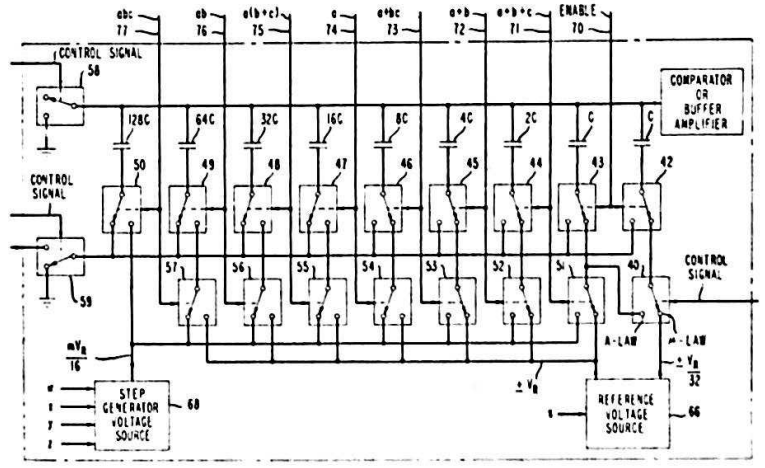
Primary Examiner—T. J. Sloyan

Attorney, Agent, or Firm—Lucian C. Canpea

[57] **ABSTRACT**

In a PCM CODEC, a binary-weighted charge redistribution capacitor array is designed to be configured for either μ-law or A-law coding. Selection of one or the other coding configuration is achieved by controlling a single gate circuit. A unique cascaded switch arrangement ensures that when selected capacitors representative of a specified coding segment are connected to a reference voltage source, the next successive capacitor of the array is automatically connected to a variable source that provides a voltage representative of a step within the specified segment.

9 Claims, 7 Drawing Figures



5.5 DIGITAL AND PULSE COMMUNICATIONS: CODE CONVERSION

ACTIVITY SUMMARY

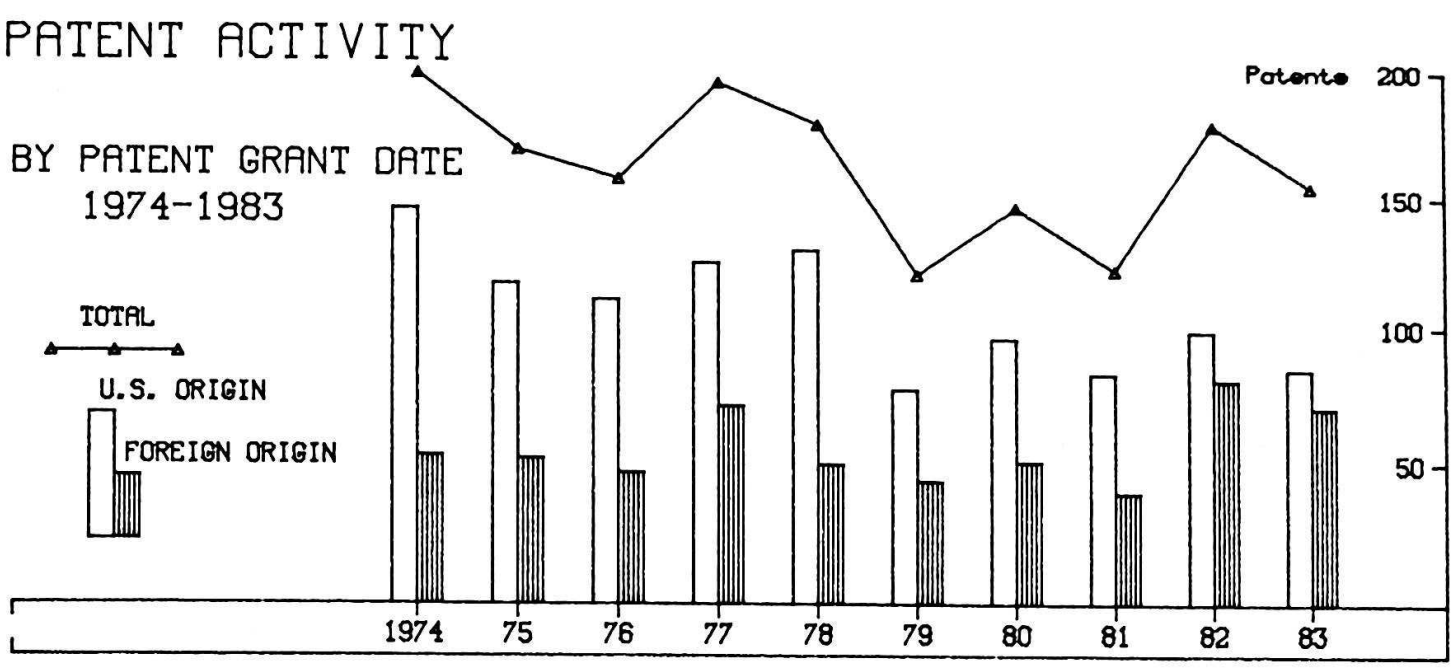
ACTIVITY INDICES (1981 - 1983)

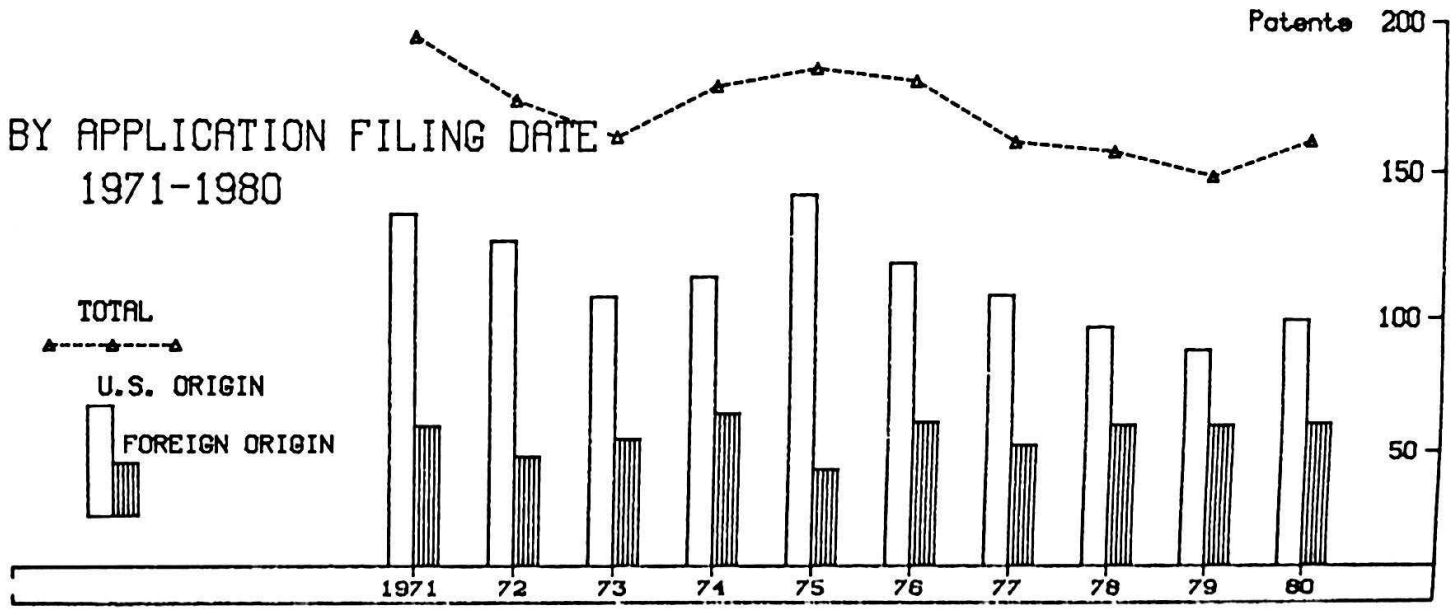
3-YEAR/10-YEAR SHARE	28.3%
FOREIGN SHARE	41.7%
CORPORATE OWNED	89.4%
GOVERNMENT OWNED	4.0%
U.S. OWNED OF FOREIGN	13.2%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 340, Subclasses 347R-347DF

Class 375, Subclass 5





5.5 DIGITAL AND PULSE COMMUNICATIONS: CODE CONVERSION

ORGANIZATIONS ASSIGNED 8 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
155	INTERNATIONAL BUSINESS MACHINES CORP.
125	BELL TELEPHONE LABORATORIES, INC.
84	UNITED STATES OF AMERICA, NAVY
63	GENERAL ELECTRIC CO.
62	MOTOROLA INC.
61	INTERNATIONAL STANDARD ELECTRIC CORP.
56	RCA CORP.
53	WESTINGHOUSE ELECTRIC CORP.
51	BENDIX CORP.
46	U.S. PHILIPS CORP.
44	NIPPON ELECTRIC CO., LTD.
43	SIEMENS AG.
43	SINGER CO.
40	SPERRY CORP.
36	UNITED STATES OF AMERICA, NASA
33	SOLARTRON ELECTRONIC GROUP LTD.
32	HONEYWELL INC.
31	HITACHI, LTD.
29	ROCKWELL INTERNATIONAL CORP.
25	BURROUGHS CORP.
25	UNITED STATES OF AMERICA, ARMY
25	XEROX CORP.
23	ANALOG DEVICES, INC.
20	TEXAS INSTRUMENTS, INC.
19	SONY CORP.
19	TOKYO SHIBAURA ELECTRIC CO., LTD.
18	FUJITSU LTD.
18	HUGHES AIRCRAFT CO.
18	UNITED STATES OF AMERICA, AIR FORCE
17	HEWLETT-PACKARD CO.
17	SINGER-GENERAL PRECISION INC.
17	THOMSON-CSF
16	HONEYWELL INFORMATION SYSTEMS INC.
16	UNITED TECHNOLOGIES CORP.
14	INDUCTOSYN CORP.
13	GORDON ENGINEERING CO.
13	NCR CORP.
12	GTE LABORATORIES INC.
12	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
12	RAYTHEON CO.
12	TEXACO INC.
12	WESTON INSTRUMENTS INC.
11	BUNKER RAMO CORP.
11	KOKUSAI DENSHIN DENWA K.K.
10	GENERAL DYNAMICS CORP.
10	GENERAL MOTORS CORP.
10	GTE AUTOMATIC ELECTRIC LABORATORIES INC.
10	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
10	NATIONAL SEMICONDUCTOR CORP.
10	NORTHERN TELECOM LTD.
10	TAKEDA RIKEN KOGYO K.K.
9	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
9	D.H. BALDWIN CO.
9	SOCIETA ITALIANA TELECOMUNICAZIONI SIEMENS S.P.A.
9	TRW INC.
9	UNITED STATES OF AMERICA, ATOMIC ENERGY COMM.
8	COLLINS RADIO CO.
8	ITEK CORP.
8	LEEDS & NORTHRUP CO.
8	TELEFONAKTIEBOLAGET LM ERICSSON

5.5 DIGITAL AND PULSE COMMUNICATIONS: CODE CONVERSION

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1576	261	344	270	210	195	166	155	193	177	119	145	121	178	154	4264
U.S. ORIGIN	1310	199	256	203	141	143	115	109	123	128	76	95	82	98	84	3162
FOREIGN ORIGIN	266	62	88	67	69	52	51	46	70	49	43	50	39	80	70	1102
JAPAN	40	10	14	20	18	16	13	15	27	21	15	19	18	38	28	312
UNITED KINGDOM	83	14	29	14	17	4	6	10	5	6	2	5	4	7	7	213
WEST GERMANY	53	10	8	8	7	7	8	6	8	9	9	7	3	10	14	167
FRANCE	27	12	20	9	14	9	6	8	10	6	3	11	7	12	6	160
NETHERLANDS	14	2	3		5	2	2		6	2	5	2	1	4	3	51
ITALY	7	4	2	2	5	4	4	2	4	1	1	2	1	3	2	44
CANADA	10	3		4		1	8	3	2	1	3	1	1	2	3	42
SWITZERLAND	12	1	4	3	2	3					1	2	1	1	3	33
SWEDEN	4	2	5	3		2		1	2	1	1			1		22
U.S.S.R.	2	1		1					1	1	2	1	2		2	13
BELGIUM	3	1		2		1	1	1								9
AUSTRIA	3		2		1	1	1									8
AUSTRALIA	1					1	1		3						1	7
NORWAY		1	1			1	1									4
CZECHOSLOVAKIA	1								1							2
POLAND	1	1														2
HUNGARY									1		1					2
IRELAND														1		1
ICELAND				1									1			1
ISRAEL	1															1
MEXICO										1						1
DENMARK	1															1
GREECE																1
CHINA(TAIWAN)	1															1
ROMANIA														1		1
CYPRUS	1															1
MONACO	1															1
BULGARIA															1	1
U.S. ORIGIN	1310	199	256	203	141	143	115	109	123	128	76	95	82	98	84	3162
U.S. CORP. OWNED	1119	167	213	172	114	121	101	94	92	112	68	80	72	80	73	2678
U.S. GOVT. OWNED	79	22	23	15	11	9	9	9	22	8	3	13	1	8	5	237
U.S. INDIV. OWNED	111	10	18	16	14	13	5	6	8	8	5	2	6	9	5	236
FOREIGN OWNED	1		2		2				1				3	1	1	11
FOREIGN ORIGIN	266	62	88	67	69	52	51	46	70	49	43	50	39	80	70	1102
U.S. OWNED	63	18	28	6	16	7	6	2	8	5	10	6	7	9	9	200
FOREIGN OWNED	203	44	60	61	53	45	45	44	62	44	33	44	32	71	61	902
FOREIGN CORP.	178	37	59	53	48	37	44	39	55	40	32	37	27	65	59	810
FOREIGN GOVT.	1	2						1	2	1		2	1	2		12
FOREIGN INDIV.	24	5	1	8	5	8	1	4	5	3	1	5	4	4	2	80

5.5 DIGITAL AND PULSE COMMUNICATIONS: CODE CONVERSION

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1283	224	193	172	160	177	183	179	159	156	148	160	107	7		3308
U.S. ORIGIN	982	166	134	125	106	113	141	118	107	96	88	99	54	5		2334
FOREIGN ORIGIN	301	58	59	47	54	64	42	61	52	60	60	61	53	2		974
JAPAN	58	16	17	15	15	22	16	22	20	24	24	28	25	1		303
UNITED KINGDOM	79	15	13	6	7	8	4	5	8	7	4	4	5			165
WEST GERMANY	42	8	7	5	5	10	5	12	8	9	8	10	8	1		138
FRANCE	54	7	7	9	10	7	6	11	3	13	8	11	3			149
NETHERLANDS	13		4	1	4	3	3	4	2	2	5	3	1			45
ITALY	10	1	7	3	3	3	2	3	2	1	2	1	3			41
CANADA	7	4			6	7	1		3	1	5		2			36
SWITZERLAND	9	4	3	2					1	1	2	2	2			26
SWEDEN	11			2		1	1	2	1		1					19
U.S.S.R.	2	1			1		1		3	1	1		4			14
BELGIUM	3	2		1	1		1									8
AUSTRIA	5		1	1	1											8
AUSTRALIA	1			1	1	1	2						1			7
NORWAY	2			1		1										4
CZECHOSLOVAKIA	1							1								2
POLAND	2															2
HUNGARY						1			1							2
IRELAND													1			1
ICELAND	1															1
ISRAEL										1						1
MEXICO	1															1
DENMARK								1								1
GREECE																
CHINA(TAIWAN)												1				1
ROMANIA																
CYPRUS																
MONACO																
BULGARIA												1				1
U.S. ORIGIN	982	166	134	125	106	113	141	118	107	96	88	99	54	5		2334
U.S. CORP. OWNED	826	135	110	106	91	98	110	96	93	86	77	87	43	4		1962
U.S. GOVT. OWNED	81	18	10	8	9	6	19	16	8	6	3	5	6	1		196
U.S. INDIV. OWNED	72	13	12	11	6	9	11	6	6	3	7	6	3			165
FOREIGN OWNED	3		2				1			1	1	1	2			11
FOREIGN ORIGIN	301	58	59	47	54	64	42	61	52	60	60	61	53	2		974
U.S. OWNED	83	6	10	8	9	4	4	9	6	8	12	7	6	1		173
FOREIGN OWNED	218	52	49	39	45	60	38	52	46	52	48	54	47	1		801
FOREIGN CORP.	196	43	48	30	41	56	34	47	41	46	45	48	45	1		721
FOREIGN GOVT.	2						2	2	2	2		1				11
FOREIGN INDIV.	20	9	1	9	4	4	2	3	3	4	3	5	2			69

5.5 DIGITAL AND PULSE COMMUNICATIONS: CODE CONVERSION

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1408
TOTAL REFERENCES CITED	9954
U.S. Patent References Cited	8859
Foreign Patent References Cited	173
Other References Cited	922

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	5027
Japan	547
United Kingdom	318
West Germany	254
France	232

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,930,255, United States of America, Navy	23
3,879,724, Vidar Corp.	16
3,940,760, Analog Devices, Inc.	15
3,872,466, Analog Devices, Inc.	15
3,942,173, Analog Devices, Inc.	13

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Bell Telephone Laboratories, Inc.	392
International Business Machines Corp.	386
United States of America, Navy	146
Westinghouse Electric Corp.	144
General Electric Co.	136

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.

**Assignee information is limited to U.S. patent references issued from 1969-1983.

6.0 TELEVISION AND FACSIMILE

CONTENTS

6.0 TELEVISION AND FACSIMILE

INTRODUCTION

Television systems operate using apparatus which essentially breaks down a given scene or image into its component parts and transmits those parts, in the form of a sequence of electrical signals, to a remote location. At the remote location, apparatus is employed to capture the signals corresponding to the component parts, and to reassemble them into an intelligible image.

The breakdown of the image or scene is accomplished by identifying the light values of discrete elemental points in a given image and converting these light values into electrical signals. The image is recreated by converting the electrical signals to discrete light values in the same spatial relationship from which they were derived. The sequential transmission and recreation of many individual images within a short time period permits the perception of motion.

In color television, besides identifying the light values, the system must be capable of identifying the color of the elemental points. This quality is also converted into an electrical signal and transmitted to the remote location so that the recreated image imparts the appropriate light and color values.

A further distinction is made between natural color television and what is identified as "pseudo color" television. By natural color it is meant that a properly operating system will serve to recreate an image that is an accurate replica of the originally viewed image. Pseudo color, on the other hand, includes apparatus to portray a color image that does not necessarily have a correlation with the originally viewed image, such as the artificial coloring of an image viewed by a black-and-white camera.

Television systems have been used to relay images across the vast distances of space or to the next room. Besides being used to entertain and inform, their application finds increasing use in business and industry.

Facsimile systems operate in the same basic manner as do television systems. That is, an image is dissected into its component parts, and a signal representing those parts is generated and transmitted to a remote location where a reverse process recreates the original image. The difference between the two is that facsimile systems are usually intended to transmit a single image of a document or photograph, for example, and are designed with that purpose in mind.

6.0 TELEVISION AND FACSIMILE

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

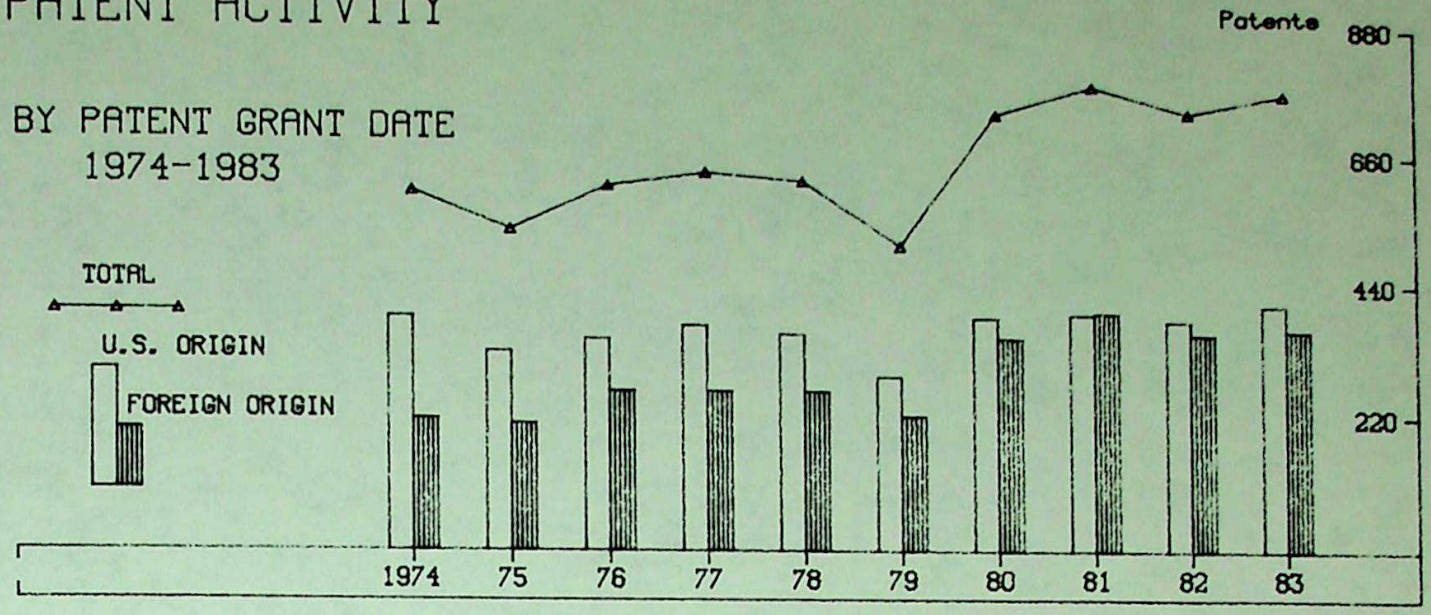
3-YEAR/10-YEAR SHARE	35.2%
FOREIGN SHARE	48.7%
CORPORATE OWNED	88.5%
GOVERNMENT OWNED	2.6%
U.S. OWNED OF FOREIGN	11.7%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

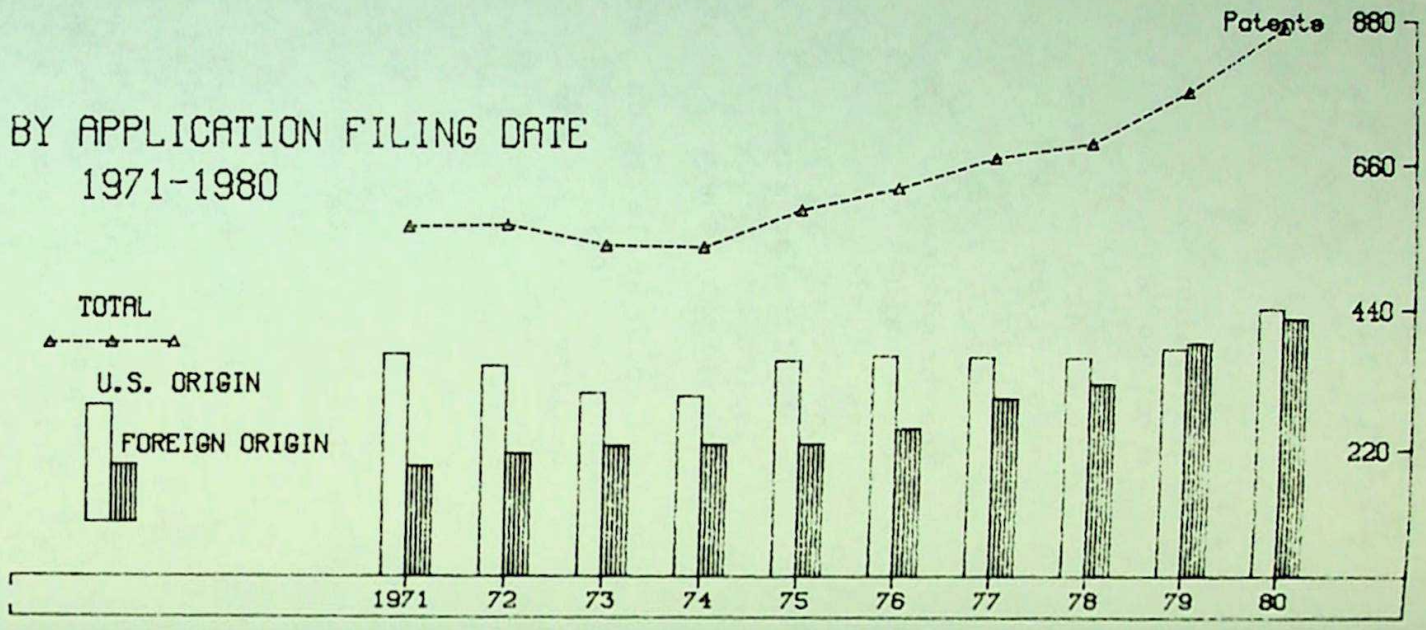
Class 358, Subclasses 1-3, 10-126, 133-304, 903-905

PATENT ACTIVITY

BY PATENT GRANT DATE
1974-1983



BY APPLICATION FILING DATE
1971-1980



6.0 TELEVISION AND FACSIMILE

ORGANIZATIONS ASSIGNED 22 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
843	RCA CORP.
336	U.S. PHILIPS CORP.
331	SONY CORP.
286	ZENITH RADIO CORP.
280	XEROX CORP.
215	HITACHI, LTD.
199	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
193	BELL TELEPHONE LABORATORIES, INC.
191	UNITED STATES OF AMERICA, NAVY
159	INTERNATIONAL BUSINESS MACHINES CORP.
155	GENERAL ELECTRIC CO.
138	GTE SYLVANIA INC.
121	WESTINGHOUSE ELECTRIC CORP.
115	TOKYO SHIBAURA ELECTRIC CO., LTD.
107	MOTOROLA INC.
98	EASTMAN KODAK CO.
98	NIPPON ELECTRIC CO., LTD.
94	HUGHES AIRCRAFT CO.
88	THOMSON-CSF
80	CANON K.K.
73	RICOH CO., LTD.
73	SIEMENS AG.
70	MAGNAVOX
69	DR. ING. RUDOLF HELL GMBH
63	ROBERT BOSCH GMBH
63	TEXAS INSTRUMENTS, INC.
60	UNITED STATES OF AMERICA, ARMY
60	FERNSEH GMBH DARMSTADT
59	SINGER CO.
58	FUJI PHOTO FILM CO., LTD.
58	VICTOR CO. OF JAPAN, LTD.
53	AMPEX CORP.
53	UNITED STATES OF AMERICA, NASA
51	CBS INC.
45	TEKTRONIX INC.
41	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
40	EXXON RESEARCH & ENGINEERING CO.
40	MARCONI CO. LTD.
36	UNITED STATES OF AMERICA, AIR FORCE
33	BELL & HOWELL CO.
33	DAINIPPON SCREEN MFG. CO., LTD.
30	CROSFIELD ELECTRONICS LTD.
30	RANK ORGANISATION, LTD.
30	THOMAS INTERNATIONAL CORP.
29	ROCKWELL INTERNATIONAL CORP.
28	KOKUSAI DENSHIN DENWA K.K.
28	SPERRY CORP.
27	MINNESOTA MINING AND MANUFACTURING CO.
27	UNITED TECHNOLOGIES CORP.
26	COMMUNICATIONS PATENTS LTD.
26	HONEYWELL INC.
26	OLYMPUS OPTICAL CO., LTD.
25	ADMIRAL CORP.
24	FUJI XEROX CO., LTD.
24	MEAD CORP.
24	SANYO ELECTRIC CO., LTD.
23	ITEK CORP.
23	STEWART-WARNER CORP.
22	BENDIX CORP.
22	GTE LABORATORIES INC.
22	IMAGE ANALYSING COMPUTERS LTD.
22	SANDERS ASSOCIATES INC.

6.0 TELEVISION AND FACSIMILE

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2086	566	769	603	693	595	529	604	627	613	503	730	779	734	768	11199
U.S. ORIGIN	1602	451	548	435	434	382	324	345	368	354	284	382	388	378	405	7080
FOREIGN ORIGIN	484	115	221	168	259	213	205	259	259	259	219	348	391	356	363	4119
JAPAN	70	31	63	65	108	86	105	127	121	124	116	186	223	206	203	1834
WEST GERMANY	119	24	40	29	49	26	24	26	31	38	32	50	57	35	58	638
UNITED KINGDOM	147	21	42	31	25	42	29	45	42	37	25	32	35	33	24	610
FRANCE	43	8	12	8	15	17	10	21	25	20	11	26	23	37	26	302
NETHERLANDS	46	12	28	11	27	15	18	16	19	16	18	21	19	21	15	302
CANADA	22	6	15	10	14	8	4	6	8	6	2	7	8	4	10	130
SWITZERLAND	12	6	5	5	3	3	4	3	3	14	4	11	13	8	9	103
ITALY	4		3	2	2	4	1	2	5	2	3	6	3	5	4	46
SWEDEN	2	1	6	2	5	4	5	6	1		1	1	3		2	39
AUSTRIA	3	1	2		3	1	2	1	1		1	3	1		1	20
BELGIUM	3	2		1	2	1					1	3		1	2	16
U.S.S.R.		1	1	2		1	3	3			1	1			2	15
AUSTRALIA	2		1		1	2		1			1		2		1	11
ISRAEL					2	2					1		1	2	2	10
ARGENTINA	1	1			1				3	1						7
HONG KONG													2	1	1	4
DENMARK	2										1		1			4
HUNGARY	1							1			1			1		4
CHINA(TAIWAN)														1	2	3
ROMANIA	1		2													3
YUGOSLAVIA					1	1										2
NEW ZEALAND				2												2
S. AFRICA			1													1
SPAIN	1															1
ICELAND		1														1
LIECHTENSTEIN								1								1
LUXEMBOURG										1						1
POLAND														1		1
WEST INDIES	1															1
INDIA	1															1
IRELAND															1	1
CZECHOSLOVAKIA	1															1
ECUADOR	1															1
EAST GERMANY												1				1
INDONESIA	1															1
OTHER(1)					1											1
U.S. ORIGIN	1602	451	548	435	434	382	324	345	368	354	284	382	388	378	405	7080
U.S. CORP. OWNED	1325	369	464	365	359	314	268	279	306	290	224	311	295	308	357	5834
U.S. GOVT. OWNED	69	38	36	34	33	20	24	26	26	16	18	21	16	8	15	400
U.S. INDIV. OWNED	206	41	43	33	41	44	32	37	35	45	42	46	70	51	29	795
FOREIGN OWNED	2	3	5	3	1	4		3	1	3		4	7	11	4	51
FOREIGN ORIGIN	484	115	221	168	259	213	205	259	259	259	219	348	391	356	363	4119
U.S. OWNED	110	31	55	34	36	31	29	30	35	43	29	49	51	40	39	642
FOREIGN OWNED	374	84	166	134	223	182	176	229	224	216	190	299	340	316	324	3477
FOREIGN CORP.	328	75	152	125	200	166	166	215	208	200	179	276	317	292	298	3197
FOREIGN GOVT.	5	1			1			1	4	3	1	6	6	8	5	41
FOREIGN INDIV.	41	8	14	9	22	16	10	13	12	13	10	17	17	16	21	239

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	2559	514	566	568	537	534	590	623	669	691	769	867	598	70	2	10157
U.S. ORIGIN	1920	354	373	354	311	306	361	369	367	366	380	441	325	39	2	6268
FOREIGN ORIGIN	639	160	193	214	226	228	229	254	302	325	389	426	273	31		3889
JAPAN	150	66	77	90	112	117	99	118	155	182	221	238	156	25		1806
WEST GERMANY	134	30	38	27	28	20	31	37	44	50	51	45	45	2		582
UNITED KINGDOM	146	24	18	38	34	36	43	33	43	24	34	40	18	2		533
FRANCE	50	9	10	12	14	19	24	23	14	24	26	41	17	1		284
NETHERLANDS	62	13	23	19	19	14	13	19	20	20	16	27	12	1		278
CANADA	36	6	9	13	3	5	5	9	4	7	10	4	8			119
SWITZERLAND	16	3	2	5	3	3	4	7	11	5	15	14	7			95
ITALY	5	1	3	2	2	3	3	4	2	6	5	4	3			43
SWEDEN	10	2	5	3	4	7		1	1	1	2	2	1			39
AUSTRIA	5	2	1	1	2		2	1		2	3					19
BELGIUM	4	1	2						2	1	1	2	1			14
U.S.S.R.	2	2			4	2	1		2			1	1			15
AUSTRALIA	3		1	1	1	1			1		1	1	1			11
ISRAEL	1	1		2				1			1	4				10
ARGENTINA	2		1				3		1							7
HONG KONG										2	1	1				4
DENMARK	2								1	1						4
HUNGARY	1					1			1			1				4
CHINA(TAIWAN)													3			3
ROMANIA	3															3
YUGOSLAVIA			1	1												2
NEW ZEALAND	1		1													2
S. AFRICA	1															1
SPAIN	1															1
ICELAND	1															1
LIECHTENSTEIN							1									1
LUXEMBOURG								1								1
POLAND										1						1
WEST INDIES																
INDIA	1															1
IRELAND												1				1
CZECHOSLOVAKIA	1															1
ECUADOR																
EAST GERMANY										1						1
INDONESIA	1															1
OTHER(1)			1													1
U.S. ORIGIN	1920	354	373	354	311	306	361	369	367	366	380	441	325	39	2	6268
U.S. CORP. OWNED	1559	300	309	283	258	250	304	302	306	285	298	364	285	36	2	5141
U.S. GOVT. OWNED	139	21	21	29	22	19	22	22	14	22	15	16	12	1		375
U.S. INDIV. OWNED	209	33	42	38	31	35	34	42	45	56	62	48	25	1		701
FOREIGN OWNED	13		1	4		2	1	3	2	3	5	13	3	1		51
FOREIGN ORIGIN	639	160	193	214	226	228	229	254	302	325	389	426	273	31		3889
U.S. OWNED	145	29	29	31	31	26	33	40	41	39	55	47	34	2		582
FOREIGN OWNED	494	131	164	183	195	202	196	214	261	286	334	379	239	29		3307
FOREIGN CORP.	443	120	148	169	182	188	187	191	248	261	315	345	226	27		3050
FOREIGN GOVT.	3		1				3	4	3	7	4	11	2			38
FOREIGN INDIV.	48	11	15	14	13	14	6	19	10	18	15	23	11	2		219

6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

DEFINITION

This profile includes systems and circuits unique to color television. Special systems include those which create holographic or stereoscopic color images. Other systems combine or format the necessary signals for the transmission and ultimate recreation of a color image. These include systems using standards adopted by countries other than the United States.

Circuits unique to color television are those that provide for proper synchronization between the transmitter and receiver, and those that provide for control of picture quality. Also included are circuits and associated elements, such as optics, for the generation of the color signal or the display of a color image.

This profile also includes pseudo color systems which artificially color the displayed image.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 6.1 are:

U.S. Patent 4,364,085. This patent describes an apparatus that can be used to color black-and-white weather pictures obtained from satellites or ground-based radar systems. The inventor suggests that this permits easier identification of land masses and bodies of water.

U.S. Patent 4,394,681. This invention is for a projection television optical system. An optical assembly which can be elevated provides a large screen display. When not in use the assembly is compactly stored by retracting it into the system cabinet.

U.S. Patent 4,134,127. This patent describes a system designed to permit the transmission of additional information along with the color television signal without interrupting the color television signal. The additional information may be news items, the exact time or emergency messages.

U.S. Patent 4,296,431. This patent describes a system which provides good color fidelity while using noise elimination techniques.

United States Patent [19]

Dalke

[11] **4,364,085**

[45] **Dec. 14, 1982**

[54] **COLORIZED WEATHER SATELLITE CONVERTER**

[75] Inventor: **James Dalke**, Bellevue, Wash.

[73] Assignee: **Arvin Industries, Inc.**, Columbus, Ind.

[21] Appl. No.: **142,781**

[22] Filed: **Apr. 22, 1980**

[51] **Int. Cl.**³ **H04N 9/02; H04N 9/535**

[52] **U.S. Cl.** **358/81**; 358/109

[58] **Field of Search** 358/81, 82, 108, 109

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,819,336	1/1958	Herbst	
3,617,630	11/1971	Reiffel	
3,749,823	7/1973	Warner	358/81
4,148,070	4/1979	Taylor	
4,149,184	4/1979	Giddings et al.	358/81
4,196,447	4/1980	Dalke	358/82

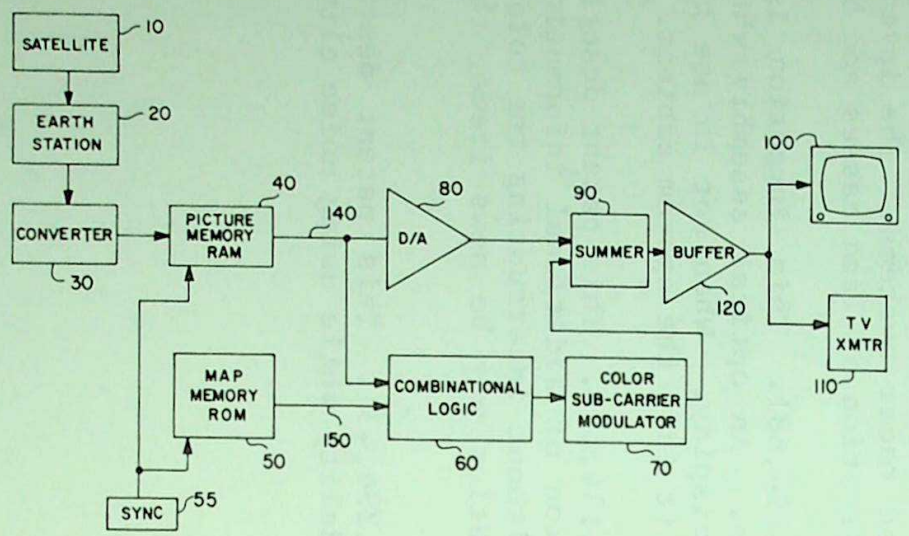
Primary Examiner—Robert L. Richardson

Attorney, Agent, or Firm—Biebel, French & Nauman

[57] **ABSTRACT**

Cloud cover information over a selected portion of the earth, such as that obtained from a satellite (10) is converted into digital form and stored in a picture memory RAM (40). The memory can be interrogated and displayed on a television monitor (100) or transmitted by a television station (110). Geographical information, such as the location of water bodies and land masses, stored in a map memory ROM (50), and this memory is interrogated at the same time as the picture memory to generate a color subcarrier which is added to the video from the picture memory. The hue of the combined picture is varied according to the intensity of the video signal from the picture memory by means of a combinational logic circuit (60). The combined black and white video from the picture memory RAM and the color subcarrier generated by the map memory ROM will provide a composite video signal with water bodies represented by a color different from the color representing land masses and where the intensity of the color generated will be an inverse function of the intensity of the video signal.

5 Claims, 5 Drawing Figures



United States Patent [19]

Rowe

[11] **4,394,681**

[45] **Jul. 19, 1983**

[54] **OPTICAL SYSTEM FOR PROJECTION TELEVISION**

[75] Inventor: **William A. Rowe**, Palatine, Ill.

[73] Assignee: **Zenith Radio Corporation**, Glenview, Ill.

[21] Appl. No.: **258,206**

[22] Filed: **Apr. 27, 1981**

[51] **Int. Cl.**³ **H04N 9/31**

[52] **U.S. Cl.** **358/60**; 358/237; 358/254

[58] **Field of Search** 358/60, 63, 231, 237, 358/238, 239, 254

[56] **References Cited**

U.S. PATENT DOCUMENTS

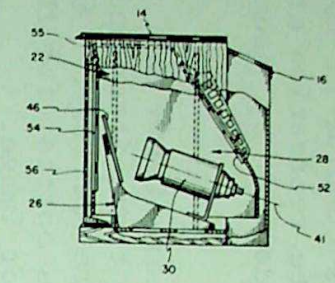
2,476,494	7/1949	Jones	358/254
2,494,364	1/1950	Shaw	358/254
2,874,211	2/1959	Burr	358/60
3,115,544	12/1963	Marley	358/60
4,257,694	3/1981	Reinhard	353/78

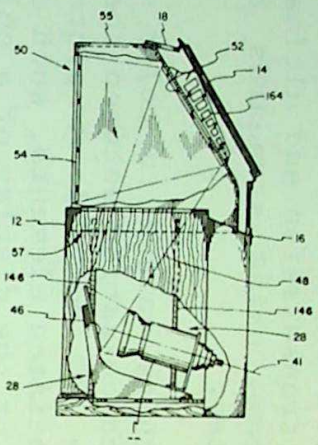
Primary Examiner—Michael A. Masinick

[57] **ABSTRACT**

A projection optical system is disclosed that is protractible and retractible within a narrow spatial column for emerging from and nesting in a cabinet of an ultra-compact, rear-projection television receiver. The system comprises in combination a stationary optical assembly permanently enclosed in a lower portion of the cabinet and having image projection means and first mirror means. A protractible optical assembly is elevatable as a unit from the cabinet; the assembly includes a mirror and a rear projection screen. The mirror and screen are at angles effective to reflect and receive, respectively, an aerial image of the television image formed by the image projection means of the stationary optical assembly. The angles are also effective for nesting the mirror and the screen with components of the stationary optical assembly. The optical system, when retracted and nested is overall depth-wise-shallow and the receiver is as compact as a conventional, large-screen console television receiver. When the system is protracted within the narrow spatial column the receiver remains depth-wise-shallow, yet it is capable of displaying an image with an area greater than three times the image area of the conventional, large-screen console television receiver.

9 Claims, 16 Drawing Figures





United States Patent [19]
Campioni
[11] **4,134,127**
[45] **Jan. 9, 1979**

[54] **COLOR TELEVISION SIGNAL INCLUDING AUXILIARY INFORMATION**

[75] Inventor: **Armando Campioni**, Turin, Italy

[73] Assignee: **Indesit Industria Elettrodomestici Italiana S.p.A.**, Rivalta, Italy

[21] Appl. No.: **719,783**

[22] Filed: **Sep. 2, 1976**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 695,694, Jun. 14, 1976, abandoned.

[30] **Foreign Application Priority Data**

Jun. 12, 1975 [IT] Italy 68510 A/75

[51] **Int. Cl.**[2] **H04N 9/46; H04N 9/38; H04N 7/04**

[52] **U.S. Cl.** **358/16; 358/19; 358/147**

[58] **Field of Search** 358/144, 145, 147, 12, 358/14, 16, 19, 20

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,162,838	12/1964	Sauvanet	358/14
3,466,387	9/1969	Rout	358/145
3,493,674	2/1970	Houghton	358/147
3,716,656	2/1973	Lambert et al.	358/14

OTHER PUBLICATIONS

Maegele, "Digital Transmission of Two Television Sound Channels in Horizontal Blanking", *Journal of SMPTE*, vol. 84, Feb. 1975. pp. 68–70.
Gassman, "Twelve Sound Channels During the Vertical Sync Interval of the Television Signal", *IEEE Trans. Broadcast and TV Receivers*, USA vol. BTR–16, No. 4, Nov. 1970, pp. 318–324.
Fink, *Television Engineering Handbook*, McGraw–Hill, 1957, pp. 2–26.

Primary Examiner—John C. Martin
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn and Macpeak

[57] **ABSTRACT**

A color television system, such as the NTSC system, in which at least a part of the chromatic information is transmitted as suppressed carrier amplitude modulation of a subcarrier, and a subcarrier burst is inserted in the signal as a reference signal for use in demodulating the signal in which the subcarrier bursts are suppressed from some of the lines of the T.V. signal and replaced by signals carrying additional sound or picture information such as emergency messages, newsflashes or the like.

17 Claims, 6 Drawing Figures

United States Patent [19]
Holland
[11] **4,296,431**
[45] **Oct. 20, 1981**

[54] **HIGH-RESOLUTION TELEVISION SYSTEM**

[75] Inventor: **Kenneth F. Holland**, Canyon Country, Calif.

[73] Assignees: **Ygnacio Inc.**, Santa Barbara; **Compact Video Systems Inc.**, Burbank, both of Calif.

[21] Appl. No.: **139,475**

[22] Filed: **Apr. 11, 1980**

[51] Int. Cl.[3] **H04N 9/38**

[52] U.S. Cl. **358/12; 358/16**

[58] Field of Search ..... 358/12, 14, 15, 16, 358/21 R, 23, 40

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,117,509	9/1978	de Boer	358/16
4,188,638	2/1980	de Haan	358/15
4,200,881	4/1980	Carnt	358/16

FOREIGN PATENT DOCUMENTS

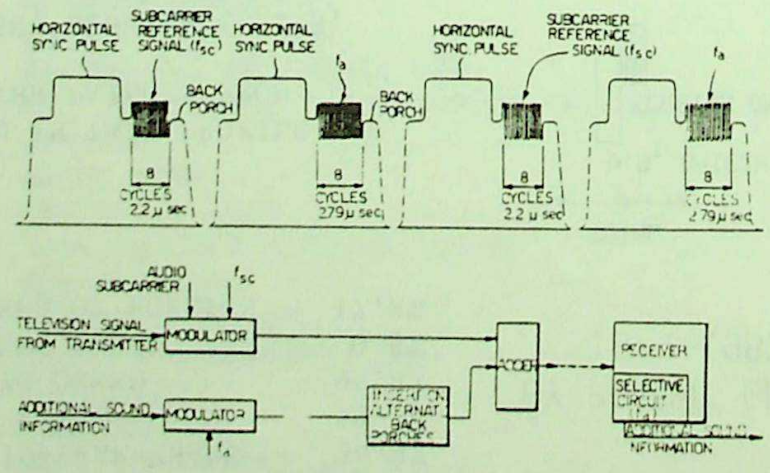
1005696	9/1965	United Kingdom	358/16

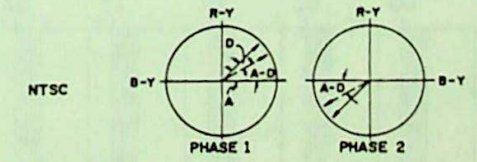
Primary Examiner—Marc E. Bookbinder
Assistant Examiner—Michael A. Masinick
Attorney, Agent, or Firm—Phillips, Moore, Weissenberger, Lempio & Majestic

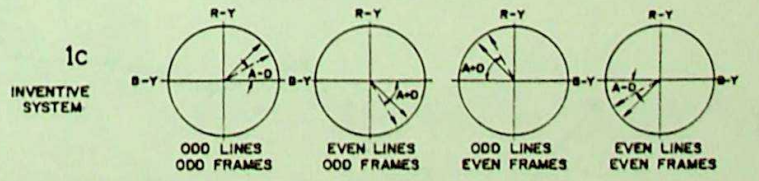
[57] **ABSTRACT**

A high-resolution television system in which color fidelity is preserved while allowing the use of frame-store type noise elimination techniques, by inverting one of the color axes at a first rate, and the other color axis at a second, different rate. While reversal of the second axis at a frame rate is preferred because it permits effective use of noise reduction techniques, reversal at other rates such as the field rate is also beneficial because it allows the filtering of the color subcarrier pattern with less degradation in image quality. In a preferred embodiment of the invention, the color subcarrier frequency is chosen as twice the standard NTSC frequency to reduce horizontal sweep harmonic interference and make the inventive equipment easily compatible with NTSC equipment. Apparatus for achieving such compatibility is described.

17 Claims, 13 Drawing Figures







6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

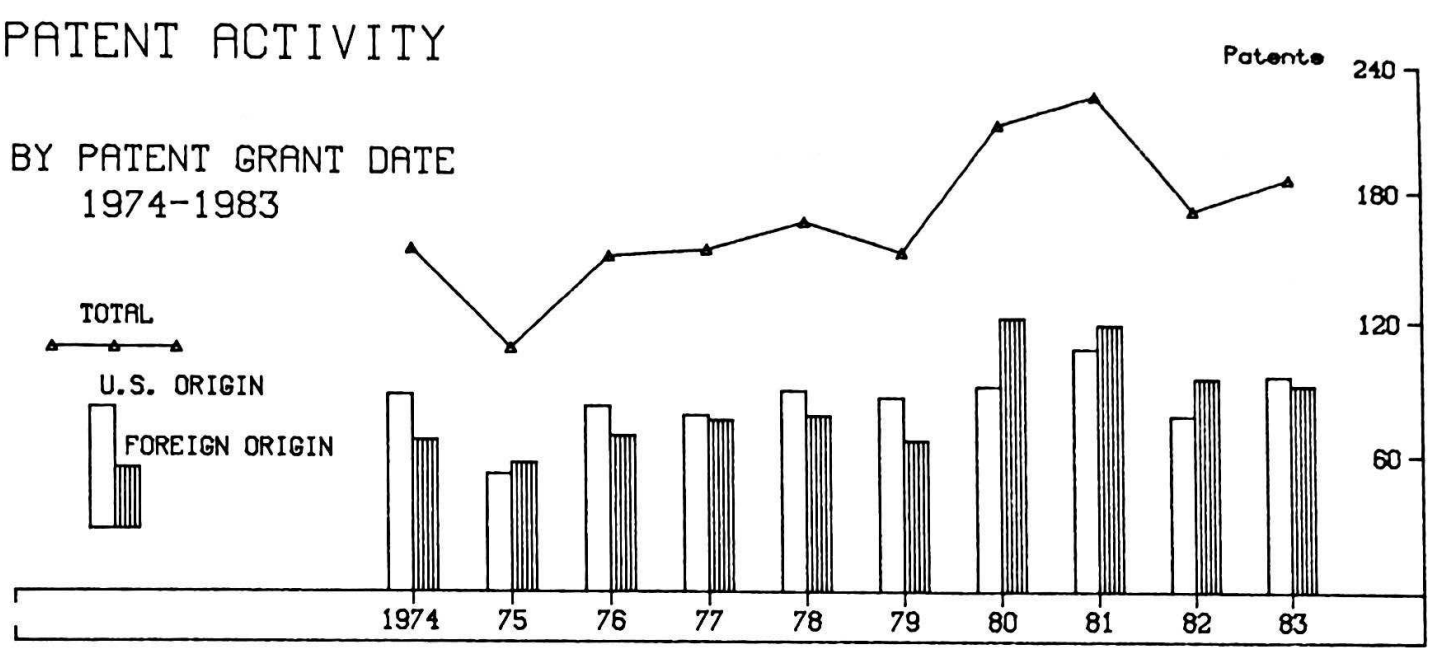
ACTIVITY SUMMARY

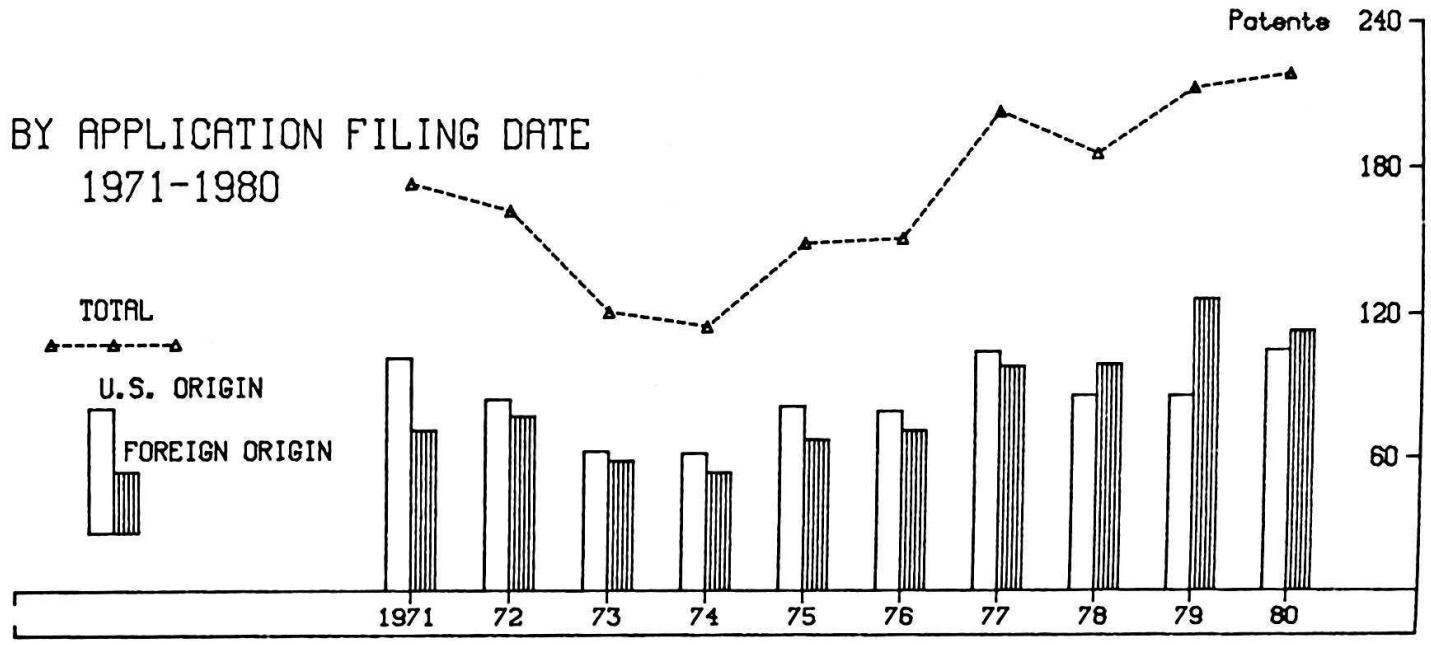
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	34.9%
FOREIGN SHARE	52.1%
CORPORATE OWNED	92.8%
GOVERNMENT OWNED	0.5%
U.S. OWNED OF FOREIGN	17.8%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 358, Subclasses 1-3, 10-74, 81-82





6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

ORGANIZATIONS ASSIGNED 6 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
392	RCA CORP.
201	SONY CORP.
126	U.S. PHILIPS CORP.
100	ZENITH RADIO CORP.
84	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
78	HITACHI, LTD.
59	GENERAL ELECTRIC CO.
56	MOTOROLA INC.
52	GTE SYLVANIA INC.
43	NIPPON ELECTRIC CO., LTD.
41	TOKYO SHIBAURA ELECTRIC CO., LTD.
38	FERNSEH GMBH DARMSTADT
38	EASTMAN KODAK CO.
38	ROBERT BOSCH GMBH
34	VICTOR CO. OF JAPAN, LTD.
31	BELL TELEPHONE LABORATORIES INC.
31	CBS INC.
30	AMPEX CORP.
25	TEKTRONIX INC.
25	WESTINGHOUSE ELECTRIC CORP.
23	MAGNAVOX CO.
21	MARCONI CO. LTD.
21	TEXAS INSTRUMENTS, INC.
18	CANON K.K.
18	THOMSON-CSF
17	BELL AND HOWELL CO.
16	SANYO ELECTRIC CO., LTD.
15	UNITED STATES OF AMERICA, NAVY
14	MINOLTA CAMERA CO., LTD.
14	THOMAS INTERNATIONAL CORP.
13	HUGHES AIRCRAFT CO.
12	ROBERT BOSCH FERNSEHANLAGEN GMBH
11	GENERAL CORP.
10	ADMIRAL CORP.
10	FUJI PHOTO OPTICAL CO. LTD.
10	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
10	POLAROID CORP.
10	QUANTEL LTD.
10	RANK ORGANISATION, LTD.
9	BRITISH BROADCASTING CORP.
9	INTERNATIONAL BUSINESS MACHINES CORP.
9	TELEFUNKEN PATENTVERWERTUNG GMBH
8	CENTRAL DYNAMICS, LTD.
8	ELECTROHOME LTD.
8	FUJI PHOTO FILM CO., LTD.
8	GTE LABORATORIES INC.
8	SIEMENS AG.
7	AGFA-GEVAERT, AG.
7	MATSUSHITA ELECTRONICS CORP.
7	NIPPON COLUMBIA K.K.
6	BASF AG.
6	EMI LTD.
6	GTE PRODUCTS CORP.
6	INDESIT INDUSTRIA ELETTRODOMESTICI ITALIANA S.P.A.
6	INTERNATIONAL VIDEO CORP.
6	MINNESOTA MINING AND MANUFACTURING CO.
6	NORTH AMERICAN PHILIPS CORP.
6	SINGER CO.
6	THOMSON BRANDT
6	UNITED STATES OF AMERICA, ARMY
6	XEROX CORP.

6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	481	167	235	173	218	152	107	149	152	165	151	211	225	171	186	2943
U.S. ORIGIN	338	115	149	103	119	86	51	81	77	88	85	90	107	77	95	1661
FOREIGN ORIGIN	143	52	86	70	99	66	56	68	75	77	66	121	118	94	91	1282
JAPAN	27	14	30	36	57	39	32	41	40	43	41	75	69	57	50	651
WEST GERMANY	19	12	20	12	14	8	8	4	8	7	7	9	17	10	15	170
UNITED KINGDOM	39	4	8	9	3	6	5	11	10	6	7	11	7	8	5	139
NETHERLANDS	23	4	13	5	14	5	5	5	6	7	3	10	5	6	7	118
FRANCE	26	5	3	2	5	4	2	4	6	4	2	3	5	5	3	79
SWITZERLAND	6	3	3	3		1			2	8	2	9	11	6	5	59
CANADA	1	5	8	3	3	1	1	2	1	1		2	1		1	30
AUSTRIA		1	1		1	1	1	1					1		1	8
ITALY									2	1	2		1	2		8
ISRAEL					1	1							1		2	5
BELGIUM		1			1						1	1				4
U.S.S.R.		1					2					1			1	1
AUSTRALIA	1															1
CZECHOSLOVAKIA											1					1
DENMARK																1
CHINA(TAIWAN)		1													1	1
ARGENTINA	1															1
HUNGARY		1														1
ICELAND																1
U.S. ORIGIN	338	115	149	103	119	86	51	81	77	88	85	90	107	77	95	1661
U.S. CORP. OWNED	289	110	133	90	99	74	43	67	63	76	70	76	85	71	84	1430
U.S. GOVT. OWNED	6	1	2	3	5	3	1	4	1	4	1				1	32
U.S. INDIV. OWNED	42	4	13	10	14	9	7	8	12	7	14	12	18	6	8	184
FOREIGN OWNED	1		1		1			2	1	1		2	4		2	15
FOREIGN ORIGIN	143	52	86	70	99	66	56	68	75	77	66	121	118	94	91	1282
U.S. OWNED	41	11	26	14	17	10	6	10	11	17	10	25	22	15	17	252
FOREIGN OWNED	102	41	60	56	82	56	50	58	64	60	56	96	96	79	74	1030
FOREIGN CORP.	91	37	57	54	79	52	47	57	62	57	53	91	95	74	71	977
FOREIGN GOVT.	1								1					2		4
FOREIGN INDIV.	10	4	3	2	3	4	3	1	1	3	3	5	1	3	3	49

6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	664	167	172	161	120	114	148	150	202	185	212	218	174	15	1	2703
U.S. ORIGIN	445	96	101	84	62	61	81	79	104	86	86	105	96	9	1	1496
FOREIGN ORIGIN	219	71	71	77	58	53	67	71	98	99	126	113	78	6		1207
JAPAN	65	39	41	42	34	36	35	37	58	69	70	62	46	5		639
WEST GERMANY	49	13	8	11	9	2	5	9	10	7	16	12	14	1		166
UNITED KINGDOM	27	6	4	6	5	6	14	4	11	8	8	9	5			113
NETHERLANDS	27	5	11	9	4	4	1	11	3	9	6	8	6			104
FRANCE	19	2	4	4	3	2	8	3	3	1	7	8				64
SWITZERLAND	8	2	1	1		1	1	2	9	3	12	12	3			55
CANADA	15	2	2	2		2	1	2		2	1		1			30
AUSTRIA	2	1		1	1		1				2					8
ITALY							1	3	1		2		1			8
ISRAEL		1		1							1	2				5
BELGIUM	2								1		1					4
U.S.S.R.	1				2				1							4
AUSTRALIA													1			1
CZECHOSLOVAKIA	1															1
DENMARK									1							1
CHINA(TAIWAN)													1			1
ARGENTINA	1															1
HUNGARY	1															1
ICELAND	1															1
U.S. ORIGIN	445	96	101	84	62	61	81	79	104	86	86	105	96	9	1	1496
U.S. CORP. OWNED	394	83	84	71	51	52	65	70	88	67	73	95	84	8	1	1286
U.S. GOVT. OWNED	7	1	3	7	1	2	3	3	1	1			1			30
U.S. INDIV. OWNED	42	12	13	6	10	5	12	6	14	16	12	6	10	1		165
FOREIGN OWNED	2		1			2	1		1	2	1	4	1			15
FOREIGN ORIGIN	219	71	71	77	58	53	67	71	98	99	126	113	78	6		1207
U.S. OWNED	51	14	15	11	7	6	6	18	16	17	28	19	16			224
FOREIGN OWNED	168	57	56	66	51	47	61	53	82	82	98	94	62	6		983
FOREIGN CORP.	157	54	52	63	48	46	59	50	78	79	95	90	60	5		936
FOREIGN GOVT.	1						1				1	1				4
FOREIGN INDIV.	10	3	4	3	3	1	1	3	4	3	2	3	2	1		43

6.1 TELEVISION AND FACSIMILE: NATURAL AND PSEUDO COLOR TELEVISION

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1517
TOTAL REFERENCES CITED	6603
U.S. Patent References Cited	5657
Foreign Patent References Cited	415
Other References Cited	531

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	2984
Japan	978
West Germany	259
United Kingdom	237
Netherlands	175

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
4,096,516, RCA Corp.	18
3,971,065, Eastman Kodak Co.	17
4,074,321, Magnavox Co.	14
3,950,780, General Electric Co.	14
3,858,240, Communications Satellite Corp.	14

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
RCA Corp.	675
Sony Corp.	287
U.S. Philips Corp.	218
Matsushita Electric Industrial Co., Ltd.	151
Bell Telephone Laboratories, Inc.	131

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

DEFINITION

This profile includes television systems designed for specific purposes such as cable television, restricted use, stereoscopic rendition, and bandwidth reduction. It also includes systems for combining the various signals which form the television transmission signal and systems which convert from one country's standard to another.

Examples of specific circuits included in this profile are those for synchronization and picture quality control. Also included are circuits used in combination with other elements such as optics, cameras, and display devices to generate a picture signal or display an image.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 6.2 are:

U.S. Patent 4,383,272. This patent describes a device for reducing transmission bandwidth by discarding information to be transmitted from some fields or frames.

U.S. Patent 4,215,370. The object of this invention is to maintain the quality of the transmitted signal while at the same time providing for the transmission of two video programs via a single satellite regenerating circuit.

U.S. Patent 4,364,090. This patent describes a system designed to improve image quality by achieving high detail resolution and avoiding all flicker effects.

U.S. Patent 4,308,554. This patent describes a system for determining viewers' listening habits and reactions.

United States Patent [19]

Netravali et al.

[11] **4,383,272**

[45] **May 10, 1983**

[54] **VIDEO SIGNAL INTERPOLATION USING MOTION ESTIMATION**

[75] Inventors: **Arun N. Netravali, Westfield, John D. Robbins, Aberdeen, both of N.J.**

[73] Assignee: **Bell Telephone Laboratories, Incorporated, Murray Hill, N.J.**

[21] Appl. No.: **253,698**

[22] Filed: **Apr. 13, 1981**

[51] Int. Cl.³ **H04N 7/12**

[52] U.S. Cl. **358/136**; 358/138; 358/105

[58] Field of Search 358/136, 133, 105, 138; 375/28; 364/518, 521

[56] **References Cited**

U.S. PATENT DOCUMENTS

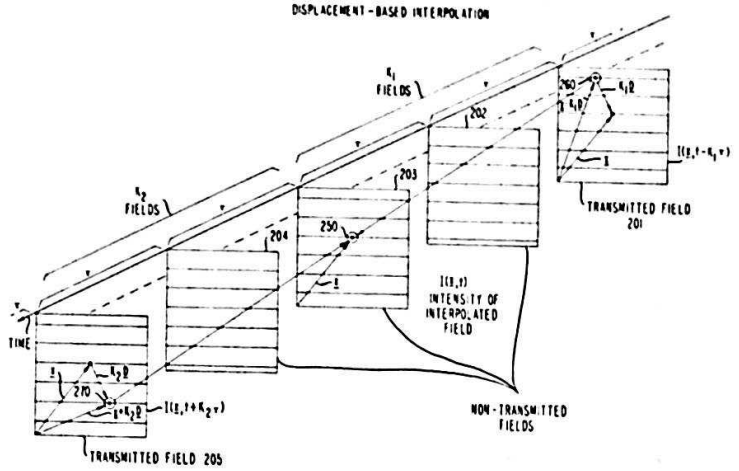
4,218,703 8/1980 Netravali et al. 358/136
4,218,704 8/1980 Netravali et al. 358/136
4,232,338 11/1980 Netravali et al. 358/136
4,307,420 12/1981 Ninomiya et al. 358/136

Primary Examiner—Benedict V. Safourek
Assistant Examiner—Edward L. Coles
Attorney, Agent, or Firm—Barry H. Freedman

[57] **ABSTRACT**

Information defining elements of a picture is estimated by interpolation using information from related locations in preceding and succeeding versions of the picture. The related locations are determined by forming an estimate of the displacement of objects in the picture. Displacement estimates are advantageously formed recursively, with updates being formed only in moving areas of the picture. If desired, an adaptive technique can be used to permit motion compensated interpolation or fixed position interpolation, depending upon which produces better results.

24 Claims, 4 Drawing Figures



220

United States Patent [19]

Kirk, Jr.

[11] **4,215,370**

[45] **Jul. 29, 1980**

[54] **SATELLITE VIDEO MULTIPLEXING COMMUNICATIONS SYSTEM**

[75] Inventor: **Donald Kirk, Jr., St. Petersburg, Fla.**

[73] Assignee: **Digital Communications, Inc., St. Petersburg, Fla.**

[21] Appl. No.: **879,861**

[22] Filed: **Feb. 22, 1978**

[51] Int. Cl.² **H04N 7/08**

[52] U.S. Cl. **358/146**

[58] Field of Search 358/142, 146

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,991,266 11/1976 Baer 358/146

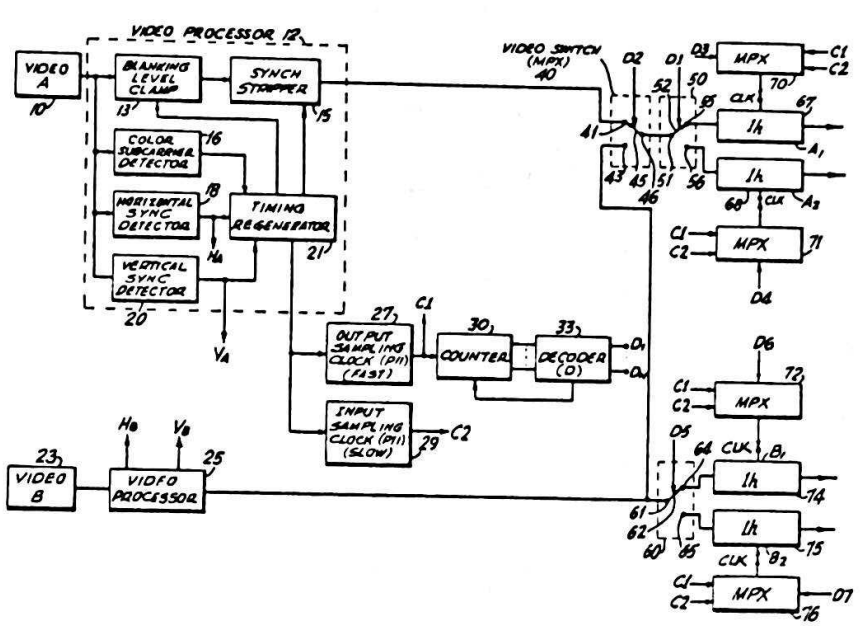
Primary Examiner—Robert L. Richardson

Attorney, Agent, or Firm—Hopgood, Calimafde, Kalil, Blaustein & Lieberman

[57] **ABSTRACT**

A video multiplexing communications system for distributing two distinct video programs via a single satellite channel utilizes time division principles, transmitting alternating lines of video information for the two programs by a single frequency modulated carrier to increase FM carrier-to-noise, thereby also maintaining each video program signal-to-noise ratio above FM detection threshold. The alternating lines are compacted in time and occupy a substantial portion of the synchronizing pulse period of the video lines; one line is partially repeated to reduce spurious system transient responses upon inter-program line switching; and amplitude expansion/reduction may be employed to maintain a large FM carrier deviation.

26 Claims, 11 Drawing Figures



United States Patent [19]
Wendland

[11] **4,364,090**
[45] **Dec. 14, 1982**

[54] **METHOD FOR A COMPATIBLE INCREASE IN RESOLUTION IN TELEVISION SYSTEMS**

[75] Inventor: **Broder Wendland**, Waltrop, Fed. Rep. of Germany

[73] Assignee: **Licentia Patent-Verwaltungs-G.m.b.H.**, Frankfurt am Main, Fed. Rep. of Germany

[21] Appl. No.: **188,913**

[22] Filed: **Sep. 19, 1980**

[30] **Foreign Application Priority Data**

Sep. 21, 1979 [DE] Fed. Rep. of Germany 2938349

[51] Int. Cl.³ H04N 5/02
[52] U.S. Cl. 358/140
[58] Field of Search 358/140, 11, 160, 188, 358/242, 127, 128.37, 65

[56] **References Cited**

FOREIGN PATENT DOCUMENTS

2000413 1/1979 United Kingdom 358/140

OTHER PUBLICATIONS

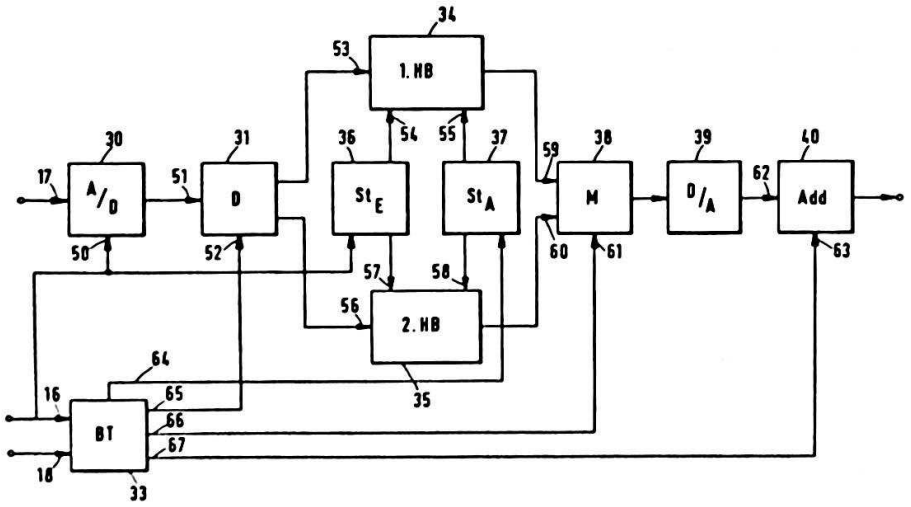
Dill, "High Resolution NTSC Television System," *IBM Technical Disclosure Bulletin*, vol. 21, No. 5, Oct. 1978, pp. 2148-2153.

Primary Examiner—John C. Martin
Attorney, Agent, or Firm—Spencer & Kaye

[57] **ABSTRACT**

Band limited standard video signals are sampled with line coupled sampling clock pulses. The sampling clock pulses are shifted from field to field by one-half a sampling interval. The sampling clock pulse rate is twice the frequency at the center of the Nyquist edge of the transmission channel. The received signal is sampled in synchronism, line coupled and offset from field to field. A video memory records the sampled values and furnishes them to the monitor at twice the sampling frequency and without flicker as a full frame. The video playback takes place at twice the line frequency or alternatively with the same line frequency and synchronous spot wobbling.

5 Claims, 8 Drawing Figures



United States Patent [19]
Percy et al.

[11] ***4,308,554***
[45] **Dec. 29, 1981**

[54] **TELEVISION VIEWER REACTION DETERMINING SYSTEM**

[75] Inventors: **Roger D. Percy**; **David C. M. Wilding**, both of Seattle, Wash.; **Sholly Kagan**, Boston, Mass.

[73] Assignee: **R. D. Percy & Company**, Seattle, Wash.

[21] Appl. No.: **890,739**

[22] Filed: **Mar. 27, 1978**

Related U.S. Application Data

[63] Continuation of Ser. No. 763,966, Jan. 31, 1977, Pat. No. 4,107,735.

[51] Int. Cl.³ H04M 7/00
[52] U.S. Cl. 358/84; 358/86; 358/194.1; 455/2; 455/5
[58] Field of Search ..... 325/31, 308, 309; 235/82, 51, 92 R, 92 CT, 92 TE, 92 TD; 358/114, 124, 85, 84, 1941, 86; 455/2, 5

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,514,086 7/1950 Owens 346/37
2,855,993 10/1958 Rahmel 358/84
3,034,707 5/1962 Jefferson 235/52
3,255,306 6/1966 Campbell et al. 358/86
3,524,015 8/1970 Campbell 358/86
3,987,397 10/1976 Belcher et al. 455/5
3,990,012 11/1976 Karmes 455/2
4,107,735 8/1978 Frohbach 358/84

OTHER PUBLICATIONS

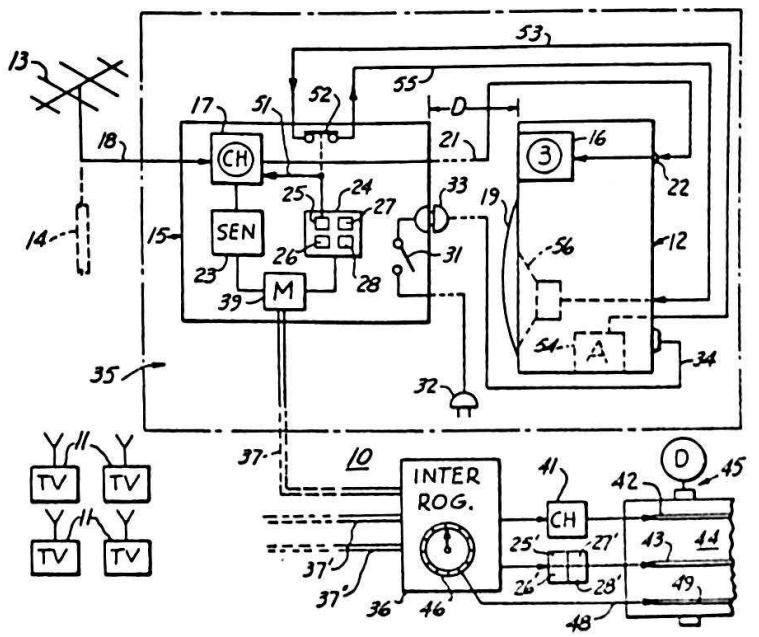
John O. Campbell, "Design Parameters for Integrated Urban Comm.", Jun. 1970, Journal of the SMPTE, pp. 532-536.

Primary Examiner—Robert L. Richardson
Assistant Examiner—Edward L. Coles
Attorney, Agent, or Firm—Benoit Law Corporation

[57] **ABSTRACT**

A system for determining viewing habits of television viewers, or television viewer reaction, in a multi-channel television broadcast reception area includes television broadcast display set. A remote control for the television set has a first manually actuable device located across the room from the television set for causing the television set to display a television broadcast received on any one of a predetermined number of channels. A facility is provided for viewers to register their reactions to displayed television broadcasts in the context of channel selection. This viewer reaction registering facility includes a second manually actuable device located adjacent the mentioned first manually actuable device. Apparatus is coupled to the remote control for determining for each broadcast displayed by the television set the channel on which that broadcast is being received and the viewer reactions to a displayed broadcast received over the latter channel.

12 Claims, 3 Drawing Figures



6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

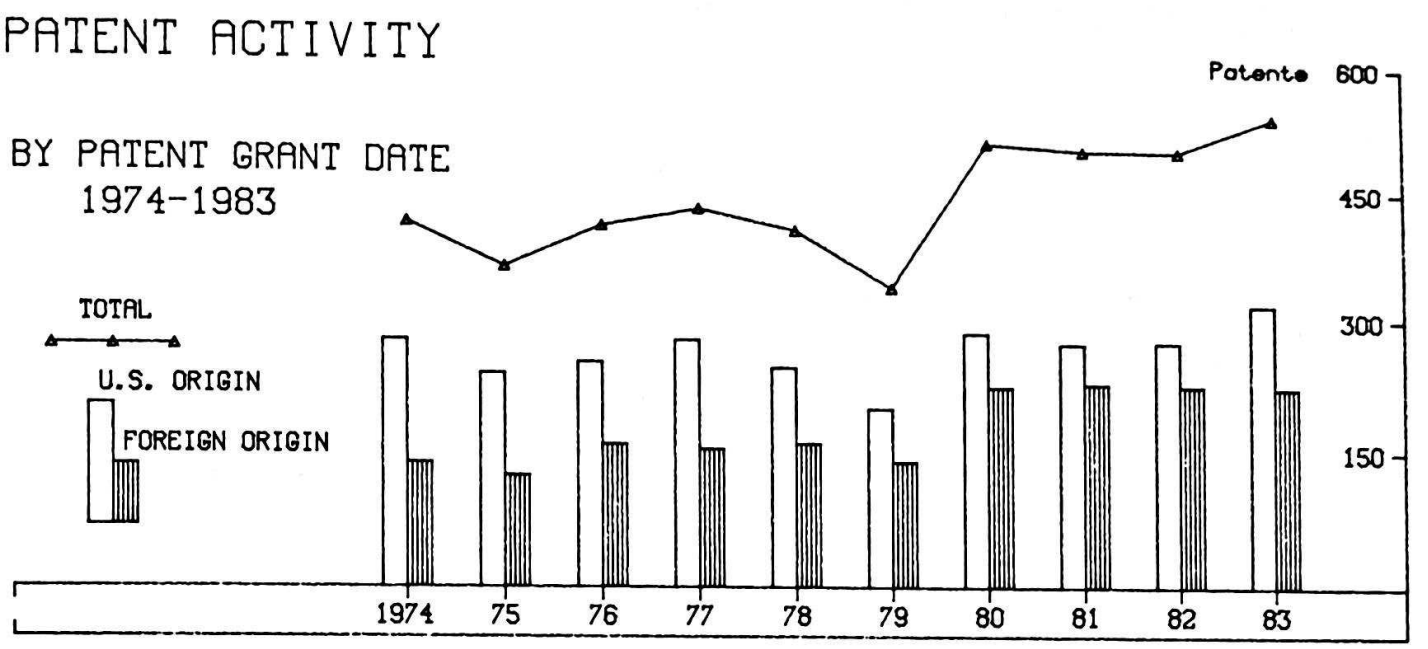
ACTIVITY SUMMARY

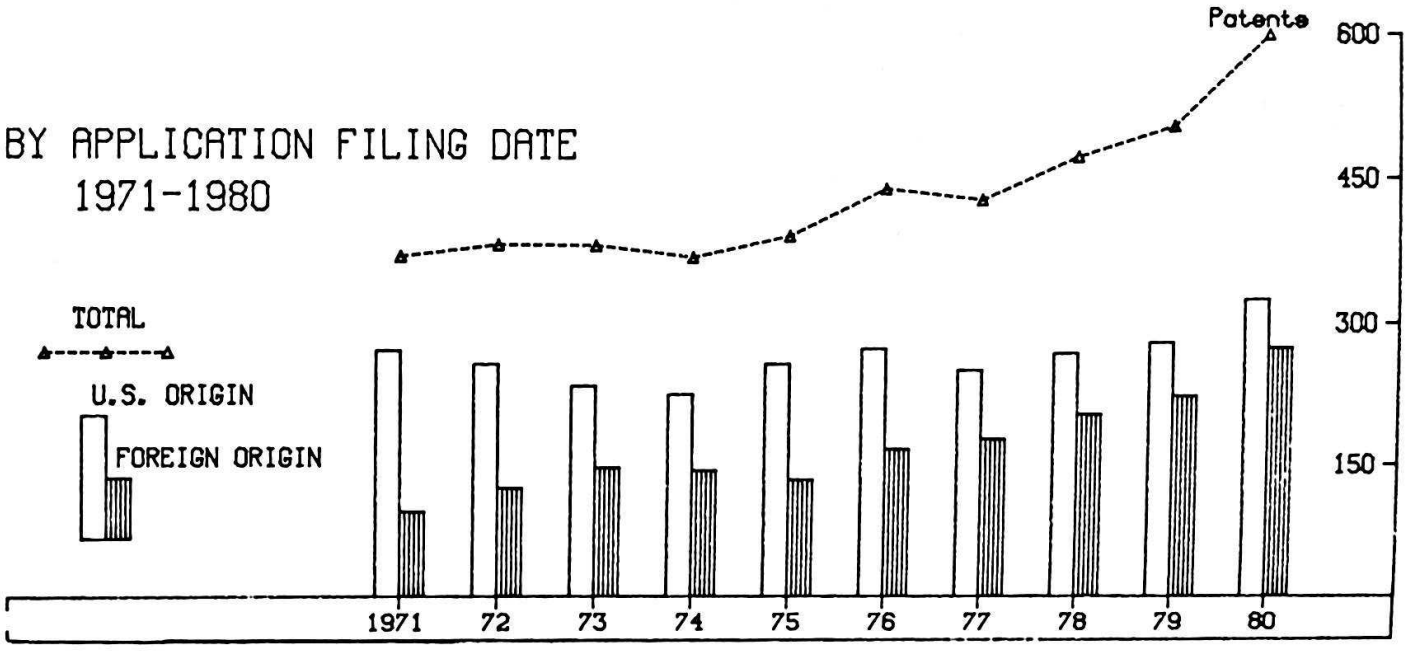
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	35.1%
FOREIGN SHARE	43.8%
CORPORATE OWNED	85.8%
GOVERNMENT OWNED	3.6%
U.S. OWNED OF FOREIGN	12.8%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 358, Subclasses 83-126, 133-255, 903-905





6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

ORGANIZATIONS ASSIGNED 15 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
560	RCA CORP.
235	U.S. PHILIPS CORP.
217	ZENITH RADIO CORP.
183	UNITED STATES OF AMERICA, NAVY
164	SONY CORP.
157	BELL TELEPHONE LABORATORIES, INC.
136	HITACHI, LTD.
107	WESTINGHOUSE ELECTRIC CORP.
100	GENERAL ELECTRIC CO.
99	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
98	GTE SYLVANIA INC.
92	INTERNATIONAL BUSINESS MACHINES CORP.
81	HUGHES AIRCRAFT CO.
77	TOKYO SHIBAURA ELECTRIC CO., LTD.
71	THOMSON-CSF
66	XEROX CORP.
57	UNITED STATES OF AMERICA, ARMY
56	MOTOROLA INC.
54	SINGER CO.
53	EASTMAN KODAK CO.
53	NIPPON ELECTRIC CO., LTD.
53	SIEMENS AG.
46	TEXAS INSTRUMENTS, INC.
46	UNITED STATES OF AMERICA, NASA
39	CANON K.K.
35	AMPEX CORP.
33	ROBERT BOSCH GMBH
33	UNITED STATES OF AMERICA, AIR FORCE
31	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
29	CBS INC.
28	MAGNAVOX CO.
27	FERNSEH GMBH DARMSTADT
27	ROCKWELL INTERNATIONAL CORP.
27	VICTOR CO. OF JAPAN, LTD.
25	MARCONI CO. LTD.
25	TEKTRONIX INC.
24	COMMUNICATIONS PATENTS LTD.
23	RANK ORGANISATION, LTD.
22	IMAGE ANALYSING COMPUTERS LTD.
22	SANDERS ASSOCIATES INC.
21	FUJI PHOTO FILM CO., LTD.
21	HONEYWELL INC.
20	BENDIX CORP.
19	SPERRY CORP.
19	THOMAS INTERNATIONAL CORP.
18	OLYMPUS OPTICAL CO., LTD.
18	UNITED TECHNOLOGIES CORP.
17	GTE LABORATORIES INC.
17	PIONEER ELECTRONIC CORP.
17	RICOH CO., LTD.
17	SINGER-GENERAL PRECISION INC.
16	ADMIRAL CORP.
16	ITEK CORP.
15	INTERNATIONAL STANDARD ELECTRIC CORP.
15	LICENTIA PATENT-VERWALTUNGS-GMBH
15	MICRO CONSULTANTS LTD.
15	MINNESOTA MINING AND MANUFACTURING CO.
15	NORTHROP CORP.
15	OAK INDUSTRIES INC.

6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1377	358	452	372	442	410	358	406	426	401	335	505	497	497	539	7375
U.S. ORIGIN	1074	298	329	287	309	274	236	249	274	243	197	283	271	273	317	4914
FOREIGN ORIGIN	303	60	123	85	133	136	122	157	152	158	138	222	226	224	222	2461
JAPAN	33	14	27	29	47	41	62	70	66	68	61	111	117	114	113	973
UNITED KINGDOM	103	15	30	17	19	33	18	31	30	27	18	22	27	20	20	430
WEST GERMANY	82	12	16	12	23	17	11	14	13	22	22	31	31	26	33	365
NETHERLANDS	23	8	21	5	11	9	13	12	14	12	16	17	15	19	11	206
FRANCE	14	4	7	6	7	15	7	12	18	17	9	21	13	30	23	203
CANADA	21	2	7	7	11	8	2	3	6	5	1	6	7	3	7	96
SWITZERLAND	7	3	2	2	3	2	3	2	1	6	2	4	6	3	2	48
SWEDEN	2	1	6	2	4	4	4	6	1		1	1	3		1	36
ITALY	4		1	2	2	3	1	1	3		3	5	3	3	4	35
AUSTRALIA	2		1			2		1			1		2		1	10
U.S.S.R.			1	1		1	1	3			1				2	10
AUSTRIA	2		1		2						1	3				9
BELGIUM	3	1		1	1									1	2	9
HUNGARY	1							1			1			1		4
ISRAEL						1					1			1	1	4
HONG KONG													2	1	1	4
ROMANIA	1		2													3
ARGENTINA	1				1											2
CHINA(TAIWAN)														1	1	2
YUGOSLAVIA					1											1
LIECHTENSTEIN								1								1
LUXEMBOURG										1						1
INDONESIA	1															1
EAST GERMANY												1				1
S. AFRICA			1													1
WEST INDIES	1															1
ECUADOR	1															1
NEW ZEALAND				1												1
NORWAY					1											1
POLAND														1		1
NORTH KOREA	1															1
U.S. ORIGIN	1074	298	329	287	309	274	236	249	274	243	197	283	271	273	317	4914
U.S. CORP. OWNED	858	227	265	230	252	220	190	195	222	192	151	220	195	214	277	3908
U.S. GOVT. OWNED	58	36	31	30	30	19	23	25	24	15	18	21	14	8	15	367
U.S. INDIV. OWNED	156	32	28	26	26	32	23	29	28	34	28	40	58	42	24	606
FOREIGN OWNED	2	3	5	1	1	3				2		2	4	9	1	33
FOREIGN ORIGIN	303	60	123	85	133	136	122	157	152	158	138	222	226	224	222	2461
U.S. OWNED	66	19	30	17	21	21	20	19	22	27	21	26	34	28	24	395
FOREIGN OWNED	237	41	93	68	112	115	102	138	130	131	117	196	192	196	198	2066
FOREIGN CORP.	204	35	83	61	98	103	99	128	119	120	110	177	176	178	177	1868
FOREIGN GOVT.	4	1						1	3	3		6	5	7	5	35
FOREIGN INDIV.	29	5	10	7	14	12	3	9	8	8	7	13	11	11	16	163

6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	1614	303	366	378	377	365	387	436	425	470	502	598	409	48	2	6680
U.S. ORIGIN	1242	217	269	255	232	223	255	271	249	267	279	324	242	30	2	4357
FOREIGN ORIGIN	372	86	97	123	145	142	132	165	176	203	223	274	167	18		2323
JAPAN	72	30	30	38	72	65	56	66	76	101	123	132	90	13		964
UNITED KINGDOM	103	18	11	31	22	28	24	30	28	18	23	27	14	2		379
WEST GERMANY	70	13	21	13	15	9	16	20	30	31	23	37	24	1		323
NETHERLANDS	40	8	10	9	14	12	11	12	19	16	12	23	9	1		196
FRANCE	29	4	5	10	11	11	15	21	11	18	17	32	16	1		201
CANADA	21	5	8	11	2	2	4	6	3	6	8	3	6			85
SWITZERLAND	8	1	1	4	2	1	3	4	3	3	5	6	2			43
SWEDEN	10	2	5	2	3	7		1	1	1	2	2				36
ITALY	3	1	2	2	1	3	1	2	2	5	5	4	1			32
AUSTRALIA	3			1	1	1			1		1	1	1			10
U.S.S.R.	1	1			4	2	1		1			1	1			12
AUSTRIA	3	2						1		2	1					9
BELGIUM	2	1	1									2	1			7
HUNGARY	1					1			1			1				4
ISRAEL				1				1				2				4
HONG KONG										2	1	1				4
ROMANIA	3															3
ARGENTINA	1		1													2
CHINA(TAIWAN)													2			2
YUGOSLAVIA				1												1
LIECHTENSTEIN							1									1
LUXEMBOURG								1								1
INDONESIA	1															1
EAST GERMANY											1					1
S. AFRICA	1															1
WEST INDIES																
ECUADOR																
NEW ZEALAND			1													1
NORWAY			1													1
POLAND											1					1
NORTH KOREA																
U.S. ORIGIN	1242	217	269	255	232	223	255	271	249	267	279	324	242	30	2	4357
U.S. CORP. OWNED	954	176	221	197	188	176	211	213	202	200	205	259	211	27	2	3442
U.S. GOVT. OWNED	125	18	18	26	21	18	21	21	13	22	15	14	12	1		345
U.S. INDIV. OWNED	152	23	29	29	23	29	23	35	33	44	55	42	19	1		537
FOREIGN OWNED	11		1	3				2	1	1	4	9		1		33
FOREIGN ORIGIN	372	86	97	123	145	142	132	165	176	203	223	274	167	18		2323
U.S. OWNED	89	16	17	19	22	19	20	27	26	25	27	36	20	2		365
FOREIGN OWNED	283	70	80	104	123	123	112	138	150	178	196	238	147	16		1958
FOREIGN CORP.	248	62	72	94	117	113	107	120	144	155	184	209	139	15		1779
FOREIGN GOVT.	2						2	4	2	6	4	10	2			32
FOREIGN INDIV.	33	8	8	10	6	10	3	14	4	17	8	19	6	1		147

6.2 TELEVISION AND FACSIMILE: TELEVISION CIRCUITS AND SYSTEMS NOT LIMITED TO COLOR APPLICATIONS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	3964
TOTAL REFERENCES CITED	21748
U.S. Patent References Cited	19093
Foreign Patent References Cited	1048
Other References Cited	1607

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	11529
Japan	1952
United Kingdom	864
West Germany	685
France	347

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,790,700, Hughes Aircraft Co.	22
2,921,124, Bell Telephone Laboratories, Inc.	22
3,919,462, Systems Development Corp.	21
3,733,430, RCA Corp.	21
3,493,674, RCA Corp.	21

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
RCA Corp.	1154
Bell Telephone Laboratories, Inc.	438
U.S. Philips Corp.	405
Zenith Radio Corp.	384
United States of America, Navy	376

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

DEFINITION

This is a profile of facsimile systems which generate multicolor or monochromatic images. It includes specialized facsimile systems which transmit a signal in addition to the picture signal, or transmit plural picture signals, or reduce the picture signal bandwidth.

This profile also includes circuits and associated elements used to generate the picture signal or to create the picture image. Examples of these are processing circuits which achieve specific effects such as halftone processing and color correction, and opto-mechanical devices which can be used to transmit or reproduce an image.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 6.3 are:

U.S. Patent 4,405,951. This patent describes a facsimile system that uses microcomputers to control various functions of the system. The patent states that the one-chip microcomputers control the system efficiently and inexpensively.

U.S. Patent 4,106,060. This is for an electronic mail box that uses facsimile equipment to forward letters, bills, or other mail to an addressee. The purpose of the invention is to ensure faster mail delivery.

U.S. Patent 4,413,287. This patent describes a system to reduce transmission time of a facsimile. It achieves this by more rapidly scanning the white areas of a document than those areas containing information.

U.S. Patent 4,318,135. This patent describes a device which permits accurate and easy alignment of plural scanning arrays in a facsimile transmitter. The patent also discloses various electronic image processing components.

United States Patent [19]

Omori et al.

[11] 4,405,951
[45] Sep. 20, 1983

[54] **FACSIMILE CONTROL SYSTEM**

[75] Inventors: **Takashi Omori; Kenji Koguchi**, both of Kanagawa; **Masahiko Yamagishi; Higehumi Takeuchi**, both of Nagano, all of Japan

[73] Assignee: **Fuji Xerox Co., Ltd.**, Kanagawa, Japan

[21] Appl. No.: **217,304**

[22] Filed: **Dec. 17, 1980**

[30] **Foreign Application Priority Data**

Dec. 18, 1979 [JP] Japan 54-163599

[51] Int. Cl.³ H04N 1/32
[52] U.S. Cl. 358/256; 358/264; 364/900
[58] Field of Search ..... 358/256, 257, 258, 264, 358/903, 364/200 MS File, 900 MS File

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,096,566	6/1978	Borie et al.	364/200
4,183,089	1/1980	Daughton	364/900
4,188,668	2/1980	Finlay	364/900

FOREIGN PATENT DOCUMENTS

137777	10/1980	Japan	358/256

OTHER PUBLICATIONS

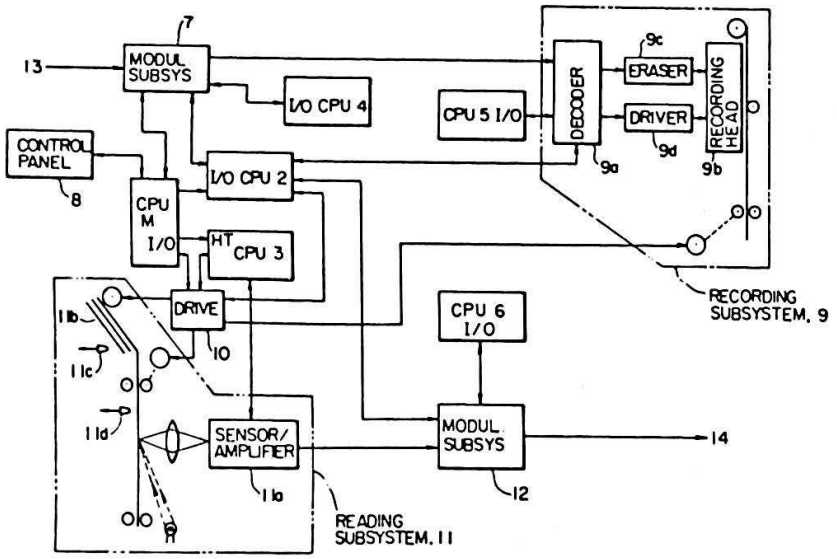
Hosagi et al.-PPC Facsimile "Panafax 6000"—National Tech Report, vol. 24, #4, Aug. 1978, pp. 634-646.
Tanaka et al.—High Speed Digital Facsimile UF-22-00—National Tech Report, vol. 24, No. 4, Aug. 1978, pp. 617-633.
Ohta et al.—High Speed Facsimile-Hifax HF950-MR/960MR—Hitachi Review, vol. 29, Aug. 1980 #4, pp. 205-210.

Primary Examiner—Joseph A. Orsino, Jr.
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak and Seas

[57] **ABSTRACT**

A facsimile system including a facsimile control system implemented with plural microcomputers one of which acts as a master microcomputer coupled to the other microcomputers in a master/slave relationship. At least one of the slave microcomputers has halt and reset inputs coupled to an input/output port of the master microcomputer while another one of the slave microcomputers is coupled through a sub-system in the facsimile system, such as a drive control circuit, to an input/output port of the master microcomputer.

3 Claims, 8 Drawing Figures



United States Patent [19]

Chapman, Jr.

[11] 4,106,060
[45] Aug. 8, 1978

[54] **ELECTRONIC MAIL BOX**

[75] Inventor: **Herbert Hill Chapman, Jr.**, Cherry Hill, N.J.

[73] Assignee: **RCA Corporation**, New York, N.Y.

[21] Appl. No.: **641,137**

[22] Filed: **Dec. 15, 1975**

[51] Int. Cl.² H04B 1/50
[52] U.S. Cl. 358/256; 358/259; 358/86; 325/4
[58] Field of Search ..... 178/5.1, 6, 5, DIG. 9; 343/100 ST; 340/146.3 F; 358/256, 86, 257, 259; 325/4

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,290,317	7/1972	Deakin	178/DIG. 9
3,594,495	7/1971	Bond	358/257
3,641,432	2/1972	Bond	178/6
3,858,180	12/1974	Spanjersberg	340/146.3 F

OTHER PUBLICATIONS

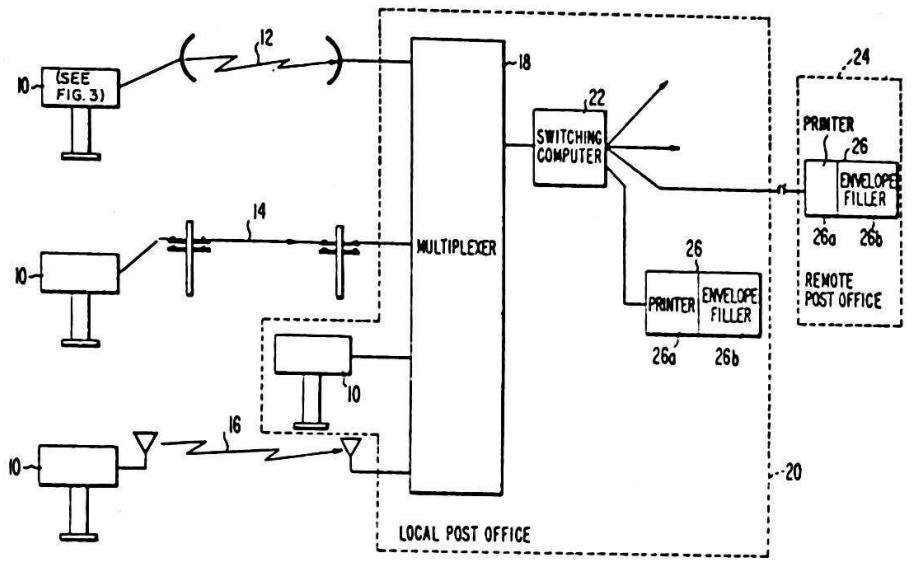
Siemens Videoset 101 "4-23-74".

Primary Examiner—Robert L. Griffin
Assistant Examiner—Edward L. Coles
Attorney, Agent, or Firm—H. Christoffersen; Joseph D. Lazar; Raymond E. Smiley

[57] **ABSTRACT**

An electronic mail box includes an entry slot for receiving a letter to be transmitted electronically to a remote point, an optical reader for converting the letter text to electronic signals, and a keyboard for receiving the address of the addressee. The address is checked for consistency. Then the text and the address are sent to the destination as determined by the address, where the letter is recreated to be delivered in the conventional manner.

6 Claims, 3 Drawing Figures



United States Patent [19]
Torpie et al.

[11] **4,413,287**
[45] **Nov. 1, 1983**

[54] **WHITE LINE SKIPPING**

[75] Inventors: **John D. Torpie, Dallas; Robert F. Lozen, Denton; Shing-Chang R. Hsieh, Richardson, all of Tex.**

[73] Assignee: **Xerox Corporation, Stamford, Conn.**

[21] Appl. No.: **368,258**

[22] Filed: **Apr. 14, 1982**

[51] Int. Cl.³ **H04N 1/17; H04N 1/40**
[52] U.S. Cl. **358/288; 358/257; 358/282**
[58] Field of Search **358/288, 257, 282, 256, 358/280**

[56] **References Cited**

U.S. PATENT DOCUMENTS

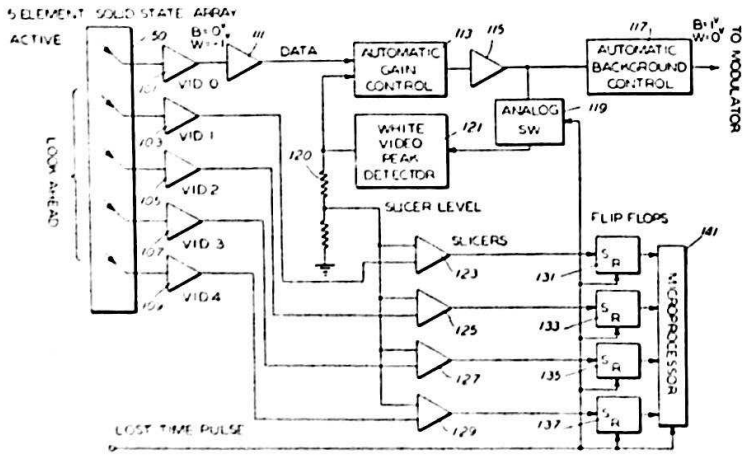
3,448,207	6/1969	Green	358/288
3,502,803	3/1970	Bigenwald	358/288
3,902,009	8/1975	Perreault	358/288
3,952,144	4/1976	Kolker	358/282
3,955,045	5/1976	Ford	358/288
4,329,717	5/1982	Logie	358/282

Primary Examiner—Howard Britton
Attorney, Agent, or Firm—Franklyn C. Weiss

[57] **ABSTRACT**

A white line skipping technique for data reduction is disclosed for reducing facsimile transmission time. Video processing for white line skipping centers around the use of a five element solid state linear array. The photosensitive area for each of the five elements corresponds to a single picture element for the defined resolution parameters. VID 0 is the active video signal and is processed in the normal manner for transmission. VID 1 through VID 4 comprise the look ahead scan elements. The slicing level is derived from the VID 0 peak detector which controls the video automatic gain control. Any black video elements encountered during a scan line causes a flip-flop to be set. At the end of each scan line, corresponding to one complete drum revolution, and during the lost time interval, the status of each flip-flop is sampled by the microprocessor to determine whether the scan line is entire white. The flip-flops are then reset for the next scan or drum revolution.

8 Claims, 7 Drawing Figures



United States Patent [19]
Allis et al.

[11] **4,318,135**
[45] **Mar. 2, 1982**

[54] **ALIGNMENT SYSTEM FOR SCANNING ARRAYS**

[75] Inventors: **Robert F. Allis, both of Rochester, N.Y.; William Kingsley; Robert F. Allis, both of Rochester, N.Y.**

[73] Assignee: **Xerox Corporation, Stamford, Conn.**

[21] Appl. No.: **84,222**

[22] Filed: **Oct. 12, 1979**
(Under 37 CFR 1.47)

[51] Int. Cl.³ **H04N 1/024**
[52] U.S. Cl. **358/294; 250/239; 358/293**
[58] Field of Search **358/213, 285, 293, 294; 250/239**

[56] **References Cited**

U.S. PATENT DOCUMENTS

Re. 29,067	12/1976	Watson	358/294
2,854,509	9/1958	Nyman	358/294
3,466,451	9/1969	Hanchett, Jr.	358/293
3,684,889	8/1972	Priessnetz et al.	250/239
3,867,569	2/1975	Watson	358/294
3,962,681	6/1976	Requa et al.	340/146.3 H
4,065,788	12/1977	Meier et al.	358/213
4,066,341	1/1978	Schubert	358/199
4,092,632	5/1978	Agulnek	340/146.3 F
4,205,349	5/1980	Kawazu et al.	358/294

FOREIGN PATENT DOCUMENTS

2819857 11/1978 Fed. Rep. of Germany 358/285

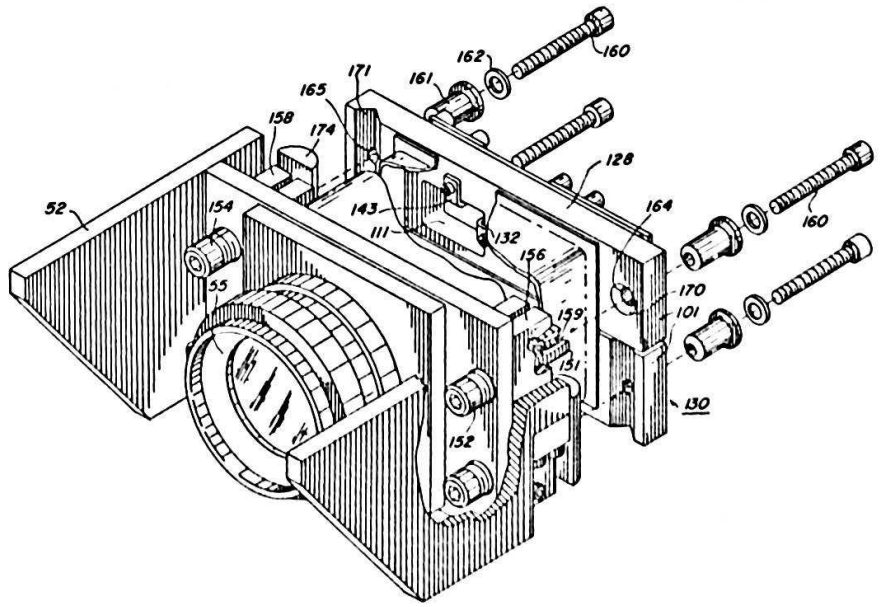
Primary Examiner—Joseph A. Orsino, Jr.
Attorney, Agent, or Firm—Frederick E. McMullen

[57] **ABSTRACT**

An image input terminal (IIT) with automatic document handler for feeding documents to be scanned into registered position on the IIT platen. The IIT includes a pair of multi-element scanning arrays with cooperating scan lamp and optics on a movable carriage disposed in scanning relationship with the platen. Analog image signals generated by the scanning arrays are initially processed in separate channels and then combined into a serial stream. The stream of analog image signals may optionally be thresholded or screened to provide binary level image signals or converted to multi-bit gray scale.

A control system including microprocessor provides timing and control signals for synchronizing operation of the scanning carriage, document handler, and image signal reading and processing together with electronic crossover between arrays to avoid loss of data, automatic signal gain control, and deletion of bad image signals or pixels. On board array alignment apparatus permits adjustment of array focus, skew, height, position and overlap.

5 Claims, 40 Drawing Figures



6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

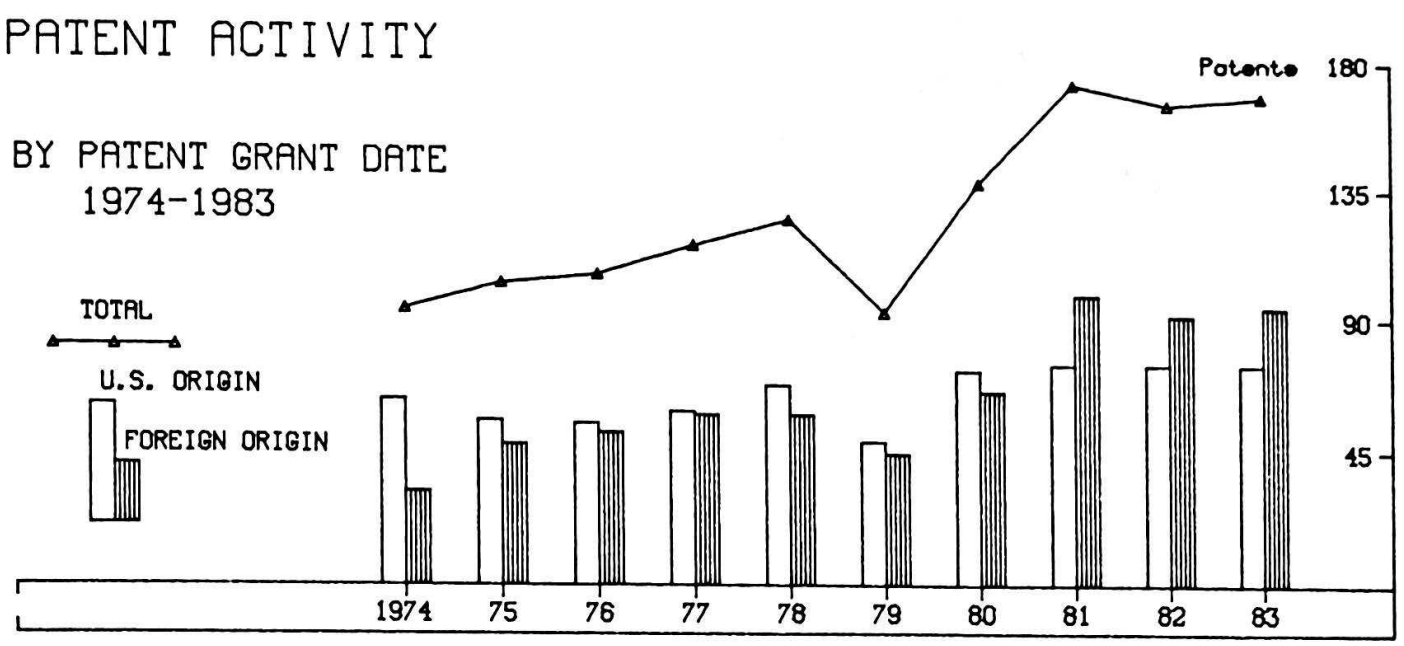
ACTIVITY SUMMARY

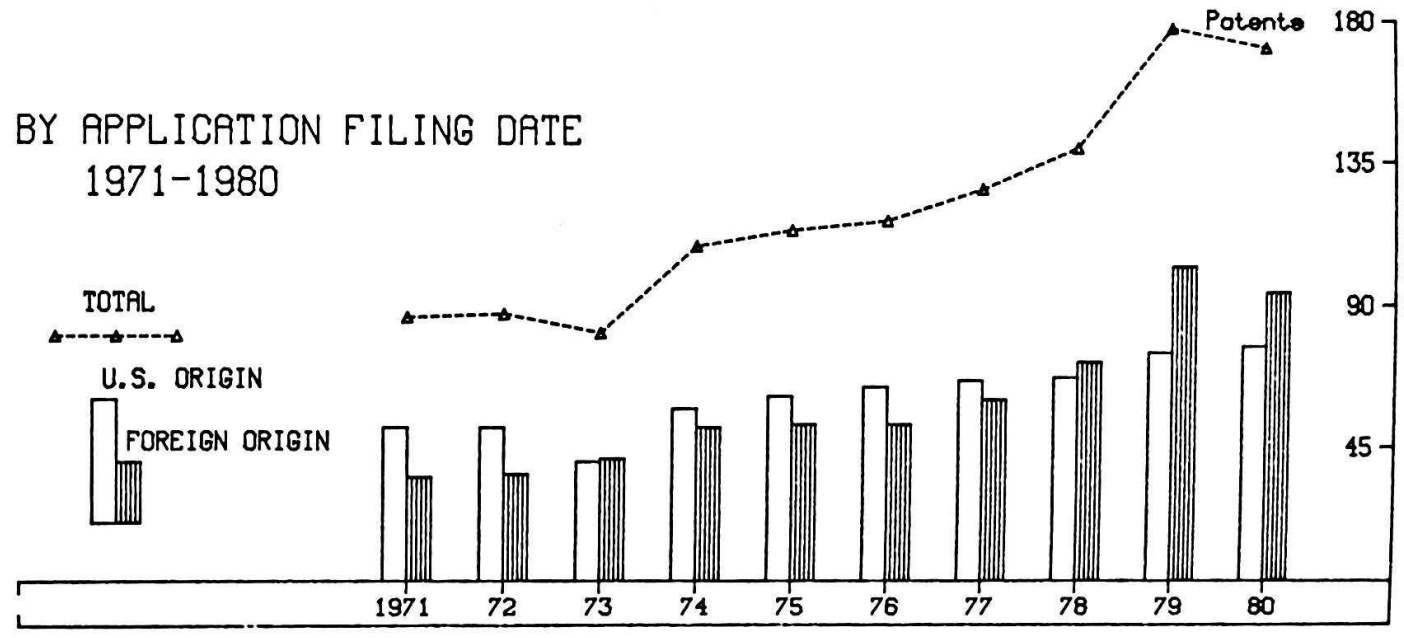
ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	39.7%
FOREIGN SHARE	56.0%
CORPORATE OWNED	93.5%
GOVERNMENT OWNED	0.8%
U.S. OWNED OF FOREIGN	5.0%

INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

Class 358, Subclasses 75-80, 256-304





6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

ORGANIZATIONS ASSIGNED 5 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
251	XEROX CORP.
75	INTERNATIONAL BUSINESS MACHINES CORP.
71	RICOH CO., LTD.
68	DR. ING. RUDOLF HELL GMBH
40	EXXON RESEARCH AND ENGINEERING CO.
38	FUJI PHOTO FILM CO., LTD.
37	CANON K.K.
35	RCA CORP.
32	DAINIPPON SCREEN MFG. CO., LTD.
32	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
28	CROSFIELD ELECTRONICS LTD.
27	BELL TELEPHONE LABORATORIES, INC.
27	EASTMAN KODAK CO.
24	MAGNAVOX CO.
24	MEAD CORP.
22	KOKUSAI DENSHIN DENWA K.K.
22	NIPPON ELECTRIC CO., LTD.
21	FUJI XEROX CO., LTD.
21	U.S. PHILIPS CORP.
19	HITACHI, LTD.
18	STEWART-WARNER CORP.
16	COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL
15	SIEMENS AG.
12	ALDEN RESEARCH FOUNDATION
12	LITTON SYSTEMS INC.
12	TOKYO SHIBAURA ELECTRIC CO., LTD.
10	GRAPHIC SCIENCES, INC.
10	NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORP.
10	OLYMPUS OPTICAL CO., LTD.
9	EG INC.
9	PRINTING DEVELOPMENTS, INC.
9	THOMSON-CSF
9	UNITED STATES OF AMERICA, NAVY
8	AMERICAN HOECHST CORP.
8	FIRMA FRANZ MORAT GMBH
8	ITEK CORP.
8	PHONOCOPY, INC. MESNE
7	AGFA-GEVAERT, AG.
7	GENERAL ELECTRIC CO.
7	INTERNATIONAL TELEPHONE AND TELEGRAPH CORP.
7	MINNESOTA MINING AND MANUFACTURING CO.
7	NCR CORP.
6	A.B. DICK CO.
6	AM INTERNATIONAL, INC.
6	DACOM, INC.
6	E.I. DU PONT DE NEMOURS & CO.
6	HAZELTINE CORP.
6	PITNEY-BOWES, INC.
6	SINGER CO.
6	SPERRY CORP.
6	UNITED TECHNOLOGIES CORP.
5	EOCOM CORP.
5	FUJITSU LTD.
5	HUGHES AIRCRAFT CO.
5	INTERNATIONAL STANDARD ELECTRIC CORP.
5	IWATSU ELECTRIC CO., LTD.
5	KONISHIROKU PHOTO INDUSTRY CO., LTD.
5	NCR CANADA LTD.
5	OKI ELECTRIC INDUSTRY CO., LTD.
5	POLAROID CORP.
5	ROBERT BOSCH GMBH
5	UNITED STATES OF AMERICA, AIR FORCE
5	UNITED STATES OF AMERICA, NASA

6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	365	74	137	105	98	93	102	105	115	124	92	137	172	165	168	2052
U.S. ORIGIN	295	65	106	78	52	62	55	54	58	67	48	72	74	74	74	1234
FOREIGN ORIGIN	70	9	31	27	46	31	47	51	57	57	44	65	98	91	94	818
JAPAN	17	4	11	7	13	15	24	24	29	30	32	31	65	67	66	435
WEST GERMANY	24	2	9	6	14	4	7	9	11	14	8	18	17	6	14	163
UNITED KINGDOM	18	3	7	8	5	6	8	9	6	7	3	5	5	7	3	100
FRANCE	4		2		4	1	2	5	4	1		7	6	7	4	47
CANADA				1	1		1	1	1		1	1	2	1	2	12
NETHERLANDS	1			1	4	1	1		1	1			2			11
SWITZERLAND				1			1	1		2				1	3	10
ITALY			2			1		1	1	1		1		1		8
SWEDEN					2		2	1		1					1	6
ARGENTINA	1								3	1						4
AUSTRIA					1		1		1							4
ISRAEL					1	1								1		3
BELGIUM	2					1						2				3
DENMARK				2									1			3
U.S.S.R.					1											2
AUSTRALIA	1					1										1
YUGOSLAVIA	1															1
SPAIN															1	1
INDIA	1															1
IRELAND				1												1
BRAZIL																1
NEW ZEALAND																1
U.S. ORIGIN	295	65	106	78	52	62	55	54	58	67	48	72	74	74	74	1234
U.S. CORP. OWNED	261	58	98	69	42	53	52	49	53	60	40	65	65	65	68	1098
U.S. GOVT. OWNED	11	2	3	4	4		1	2	1			1	2			31
U.S. INDIV. OWNED	23	5	5	3	6	8	2	2	4	7	8	6	7	7	4	97
FOREIGN OWNED				2		1		1						2	2	8
FOREIGN ORIGIN	70	9	31	27	46	31	47	51	57	57	44	65	98	91	94	818
U.S. OWNED	10	2	5	5		2	5	3	6	9	3	7	5	4	5	71
FOREIGN OWNED	60	7	26	22	46	29	42	48	51	48	41	58	93	87	89	747
FOREIGN CORP.	50	7	24	21	39	28	38	44	47	45	39	57	87	83	86	695
FOREIGN GOVT.	1				1						1		1	1		5
FOREIGN INDIV.	9		2	1	6	1	4	4	4	3	1	1	5	3	3	47

6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	445	86	86	87	81	108	113	116	126	139	177	171	120	19	1	1875
U.S. ORIGIN	355	67	51	51	40	57	61	64	66	67	75	77	53	8	1	1093
FOREIGN ORIGIN	90	19	35	36	41	51	52	52	60	72	102	94	67	11		782
JAPAN	25	5	10	20	19	25	20	31	38	39	64	74	45	10		425
WEST GERMANY	25	6	11	5	6	10	12	13	9	18	20	3	12			150
UNITED KINGDOM	26	2	3	6	9	6	10	1	10	3	7	7	2			92
FRANCE	3	3	2	1	1	6	3	3		7	7	6	2	1		45
CANADA	1			1	1	1		1	1	2	2	1	1			12
NETHERLANDS	1		4	1	1		1	1			1	1				11
SWITZERLAND	1				1	1		2			1		3			9
ITALY	2		1		1		2			1			1			8
SWEDEN		1		1	1	2							1			6
ARGENTINA							3		1							4
AUSTRIA			1		1		1									3
ISRAEL	1			1								1				3
BELGIUM			1						1	1						3
DENMARK	2									1						3
U.S.S.R.		2			1	1										4
AUSTRALIA			1													1
YUGOSLAVIA			1													1
SPAIN	1															1
INDIA	1															1
IRELAND												1				1
BRAZIL																
NEW ZEALAND	1															1
U.S. ORIGIN	355	67	51	51	40	57	61	64	66	67	75	77	53	8	1	1093
U.S. CORP. OWNED	311	62	41	42	37	53	55	58	62	59	67	68	48	8	1	972
U.S. GOVT. OWNED	13	3	3	2	1	1		1		1		2				27
U.S. INDIV. OWNED	29	2	7	6	2	3	6	4	4	7	8	5	3			86
FOREIGN OWNED	2			1				1				2	2			8
FOREIGN ORIGIN	90	19	35	36	41	51	52	52	60	72	102	94	67	11		782
U.S. OWNED	15			2	2	4	9	7	5	5	9	2	4			64
FOREIGN OWNED	75	19	35	34	39	47	43	45	55	67	93	92	63	11		718
FOREIGN CORP.	64	17	31	32	35	43	41	41	52	66	86	90	59	11		668
FOREIGN GOVT.	1		1						1	1	1					5
FOREIGN INDIV.	10	2	3	2	4	4	2	4	2		6	2	4			45

6.3 TELEVISION AND FACSIMILE: FACSIMILE OR PICTORIAL COMMUNICATION SYSTEMS

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	1180
TOTAL REFERENCES CITED	9617
U.S. Patent References Cited	8938
Foreign Patent References Cited	260
Other References Cited	419

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	3728
Japan	755
West Germany	399
United Kingdom	325
France	109

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,541,245, Crosfield Electronics Ltd.	24
3,272,918, Dr. Ing. Rudolf Hell GmbH	21
3,604,846, Mead Corp.	20
3,962,681, Recognition Equipment Inc.	18
4,046,471, International Business Machines Corp.	17

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
Xerox Corp.	530
International Business Machines Corp.	348
Dr. Ing. Rudolf Hell GmbH	162
RCA Corp.	155
Bell Telephone Laboratories, Inc.	127

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

7.0 TELEMETRY

CONTENTS

7.0 TELEMETRY

DEFINITION

Telemetry involves measuring a parameter and transmitting the measured value over a telecommunications medium to a remote receiver. The measurement can be either automatic or manual. Given this definition, it is inevitable that there is much overlap between telemetry and the other categories in this report. However, the patents included in this profile are limited to circuits and systems in which the measuring, transmitting, and/or receiving of telemetric data are significant. This includes the data format and the method of transmission chosen.

Telemetry is becoming increasingly important in the medical field, for the remote monitoring of a patient's vital signs; in the utility field, for remote meter reading; and in any other environment where constant or intermittent monitoring of system parameters is necessary. Since telemetry does not compare in size with the other major areas of this report, it is presented as a single profile.

SELECTED PATENTS

The four patents selected to represent inventions in Profile 7.0 are:

U.S. Patent 4,295,139. This patent shows a telemetry system designed to improve airport safety. With this system, aircraft in the vicinity of the airport are given constantly updated information about weather conditions which affect take-off and landing maneuvers.

U.S. Patent 4,357,606. This patent shows fiber optic cables used in a telemetry monitoring system for a hazardous or explosive environment. When light sensing and transmitting elements are used there is no potential for dangerous sparks.

U.S. Patent 4,399,440. This invention is a system using line current and voltage as a signal carrier. Such systems, common in the field of telemetry, efficiently use the available bandwidth by modulating information onto an existing electrical signal, i.e., the power signal.

U.S. Patent 4,354,190. This is an example of a system designed for remote monitoring of the position of a rotating part. In such systems, position signals must be transmitted through some means other than a direct connection since such a connection would interfere with the rotary movement.

United States Patent [19]

Arpino

[11] 4,295,139
[45] Oct. 13, 1981

[54] METHOD FOR TRANSMITTING AIRPORT WEATHER INFORMATION

[76] Inventor: Roberto Arpino, 4722 Shire Ridge Rd. West, Columbus, Ohio 43220

[21] Appl. No.: 36,518

[22] Filed: May 7, 1979

[51] Int. Cl.³ G01W 1/10; G01C 21/00

[52] U.S. Cl. ..... 340/870.01; 340/27 R; 340/870.01

[58] Field of Search ..... 340/152 R, 27 R, 27 NA, 340/207 R; 73/178 T, 178 R

[56] References Cited

U.S. PATENT DOCUMENTS

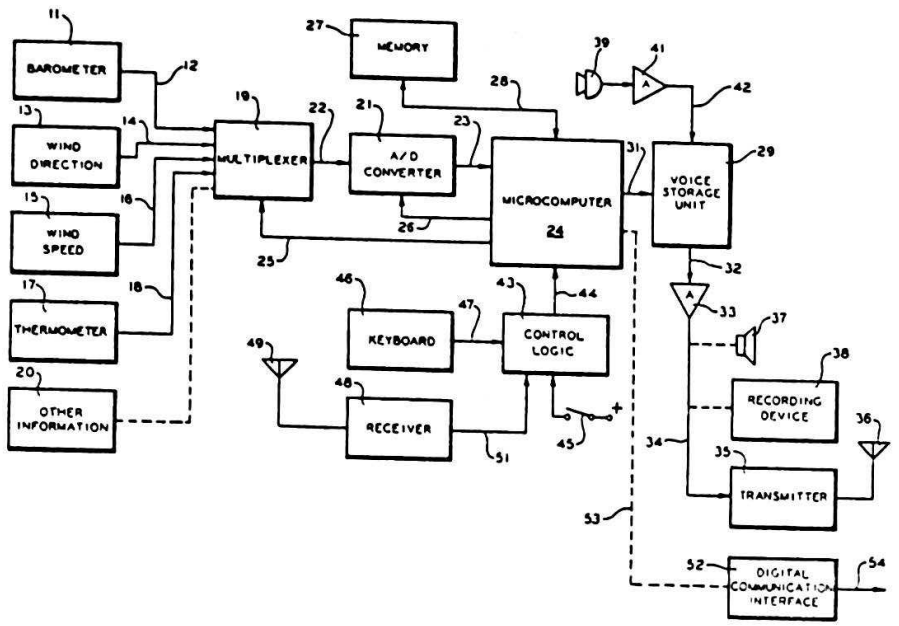
3,281,789	10/1966	Willcox et al.	340/152 R
3,373,405	3/1968	Gadbois	340/147 R
3,949,399	4/1976	Huber et al.	340/27 NA
4,043,194	8/1977	Tanner	340/27 NA
4,079,905	3/1978	Greene	73/178 R
4,163,216	7/1979	Arpino	340/152 R

Primary Examiner—Donald J. Yusko
Attorney, Agent, or Firm—Wilson, Fraser, Barker & Clemens

[57] ABSTRACT

A method for providing real-time weather and other information about an airport to an aircraft. The method comprises the steps of generating a signal representing instantaneous weather information, determining a real-time weather information value from the instantaneous weather information signal over a predetermined time interval, generating an address signal representing the real-time weather information value, storing a plurality of signals representing real-time weather information messages, generating one of the message signals corresponding to the real-time weather information value in response to the address signal, and transmitting the message signal to a receiver on the aircraft.

7 Claims, 2 Drawing Figures



United States Patent [19]

Fortescue

[11] 4,357,606
[45] Nov. 2, 1982

[54] MULTI-STATION TELEMETRY SYSTEM USING FIBRE OPTICS CABLES

[75] Inventor: Michael Fortescue, Stanstead Mountfitchett, England

[73] Assignee: A. C. Cossor Limited, Harlow, England

[21] Appl. No.: 176,925

[22] Filed: Aug. 11, 1980

[30] Foreign Application Priority Data

Aug 16, 1979 [GB] United Kingdom 7928609

[51] Int. Cl.³ G08C 19/00; H04Q 9/00

[52] U.S. Cl. 340/870.01; 350/96.16; 370/1; 340/870.29

[58] Field of Search 340/151, 870.29, 870.01, 350/96.16, 370/1

[56] References Cited

U.S. PATENT DOCUMENTS

4,117,460	9/1978	Walworth	340/870.29
4,124,839	1/1978	Cohen	340/151
4,166,946	9/1979	Chown	350/96.16

FOREIGN PATENT DOCUMENTS

1221974	2/1971	United Kingdom .
1317386	5/1973	United Kingdom .
1493138	11/1977	United Kingdom .
1504792	3/1978	United Kingdom .
1534786	12/1978	United Kingdom .

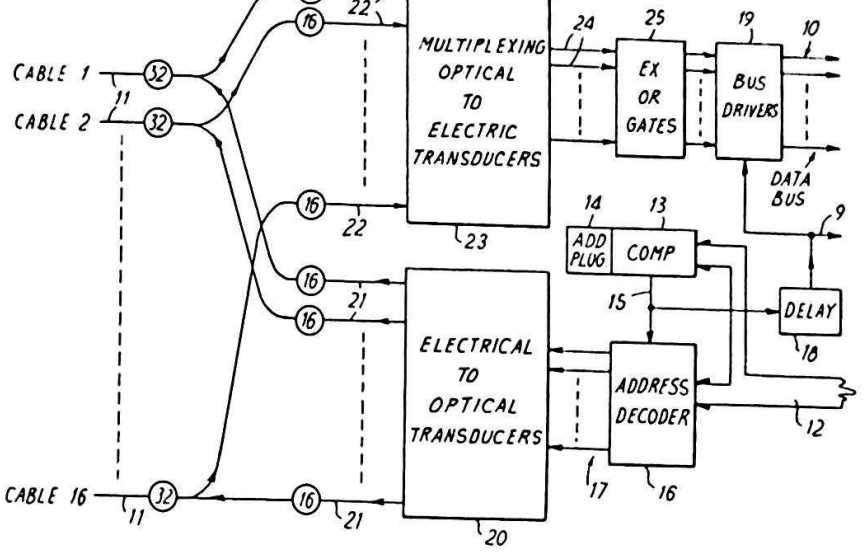
Primary Examiner—Harold I. Pitts
Attorney, Agent, or Firm—Robert F. O'Connell

[57] ABSTRACT

The system interfaces with a conventional data bus 10 and address bus 12. A decoded address pulses one address line 17 and a corresponding transducer 20 launches light pulses on all sixteen fibres of a cable 21. All cables 21 lead to corresponding transducer stations from which return cables 22 with sixteen fibres return to the central station. The return cable fibres interface with transducers 23 which correspond to bits rather than transducer stations. Data from the transducer stations is therefore multiplexed on to a sixteen data bus 10. At each transducer station, the ends of the sixteen fibres 21 face the ends of the sixteen fibres 22 across a gap in which an encoding disc rotates. Clear and opaque areas around tracks on the disc provide encoding by allowing light pulses to return on selected fibres 22 in codes corresponding to angular positions of the disc. The codes are preferably Gray codes and exclusive OR gates 25 may then be employed to transcode to binary on the bus 10.

The invention is especially useful in hazardous environments and can eliminate the use of some explosion-proof enclosures and ducted cabling in gas, oil and chemical plants utilizing telemetry for process control.

7 Claims, 6 Drawing Figures



United States Patent [19]
Douglas

[11] 4,399,440
[45] Aug. 16, 1983

[54] **ADDRESSABLE TRANSDUCER WITH A VARIABLE FREQUENCY OSCILLATION FOR MONITORING A PHYSICAL QUANTITY**

[75] Inventor: **Norman F. Douglas**, Albuquerque, N. Mex.

[73] Assignee: **Sparton Corporation**, Jackson, Mich.

[21] Appl. No.: **235,349**

[22] Filed: **Feb. 17, 1981**

[51] Int. Cl.³ G08C 19/16; G08C 19/04
[52] U.S. Cl. 340/870.26; 340/870.03; 340/870.11; 340/870.38; 340/870.39; 340/870.07; 340/870.18
[58] Field of Search ..... 340/870.03, 370.26, 340/870.38, 870.18, 870.11, 310 R, 310 A, 870.07, 870.39; 179/175.3 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

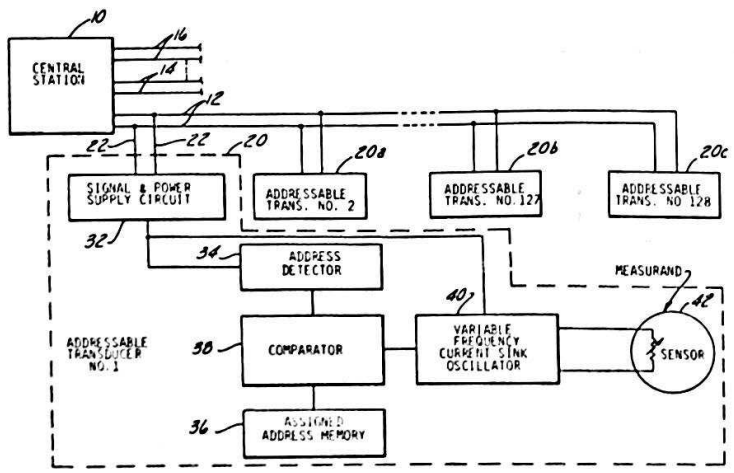
3,800,300	3/1974	Van Oosterhout	340/870.26
3,944,928	3/1976	Augenblick et al.	340/870.18
3,952,285	4/1976	Falck	340/870.11
4,204,195	5/1980	Bogacki	340/870.11

Primary Examiner—James J. Groody
Attorney, Agent, or Firm—Reising, Ethington, Barnard, Perry, Brooks & Milton

[57] **ABSTRACT**

An addressable transducer is disclosed for use in monitoring the values of physical conditions in connection with long electric lines, such as telephone cables. Multiple transducers are connected across a single pair of transmission lines which extend from a central station and supply a DC voltage to the transducers. Each transducer has an assigned address in the form of a binary code. An address signal is transmitted on the transmission lines by pulse width modulation of the line voltage. An address detector converts the address to a binary code and the transmitted address is compared with the assigned address. When the assigned address is received, a variable frequency current sink oscillator is turned on and connected across the lines. The oscillator has a frequency determined by a sensor responsive to the physical condition being measured and modulates the line current at that frequency. The frequency of the line current modulation is measured at the central station and represents the value of the physical condition.

5 Claims, 7 Drawing Figures



United States Patent [19]
Reschovsky

[11] 4,354,190
[45] Oct. 12, 1982

[54] **ROTOR MEASUREMENT SYSTEM USING REFLECTED LOAD TRANSMISSION**

[75] Inventor: **John M. Reschovsky**, Schenectady, N.Y.

[73] Assignee: **General Electric Company**, Schenectady, N.Y.

[21] Appl. No.: **137,422**

[22] Filed: **Apr. 4, 1980**

[51] Int. Cl.³ G08C 19/16
[52] U.S. Cl. 340/870.18; 340/870.32; 340/870.39; 340/870.42
[58] Field of Search ..... 340/870.01, 870.1, 870.16, 340/870.17, 870.18, 870.26, 870.32, 870.38, 870.39, 870.42; 323/75 N

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,657,717	4/1972	Glantschnig et al.	340/870.39
3,742,473	6/1973	Hadden	340/870.39
3,758,845	9/1973	MacKelvie et al.	340/870.39
4,150,358	4/1979	Avander	340/870.31
4,198,621	4/1980	Roper	340/870.39
4,225,851	9/1980	Reschovsky et al.	340/870.18
4,232,922	11/1980	Teass	73/136 A
4,242,665	12/1980	Mate	340/870.39
4,242,666	12/1980	Reschovsky et al.	340/870.28

FOREIGN PATENT DOCUMENTS

1527361	10/1978	United Kingdom	340/870.39

OTHER PUBLICATIONS

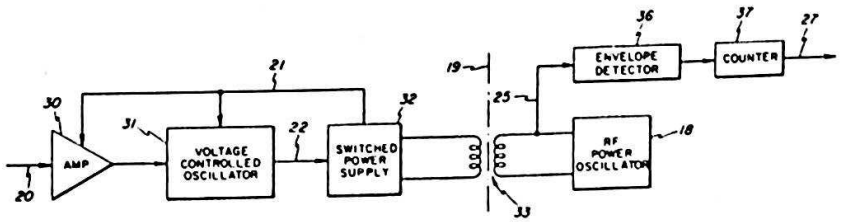
"Telemetry Standards", Aydin Vector Division, Nov. 1975.

Primary Examiner—James J. Groody
Attorney, Agent, or Firm—Ormand R. Austin; John F. Ahern

[57] **ABSTRACT**

An apparatus is provided for obtaining data from sensor measurements made on a body moving rotationally with respect to a stationary observer. Radio frequency energy is reactively coupled between an energy source fixed with respect to the observer and load varying means located on the moving body. The load variance is dependent upon measurement data provided by sensors located on the moving body. The variation in load is reflected back through the reactive coupler to a detector which is fixed with respect to the observer. The detector operates to provide signals indicative of the measurement data provided by the sensors. The apparatus of the present invention may be easily retrofitted to rotational devices such as turbines, motors and generators to provide relevant, continuous, on-line measurements of important parameters associated with such rotating systems. These parameters include such measurements as temperature, pressure, strain and torque. Because of the reflected load nature of the formation transmission, only a single coupling is provided and this coupling serves to carry both power and information signals.

7 Claims, 3 Drawing Figures



7.0 TELEMETRY

ACTIVITY SUMMARY

ACTIVITY INDICES (1981 - 1983)

3-YEAR/10-YEAR SHARE	26.9%
FOREIGN SHARE	29.2%
CORPORATE OWNED	78.0%
GOVERNMENT OWNED	3.8%
U.S. OWNED OF FOREIGN	5.8%

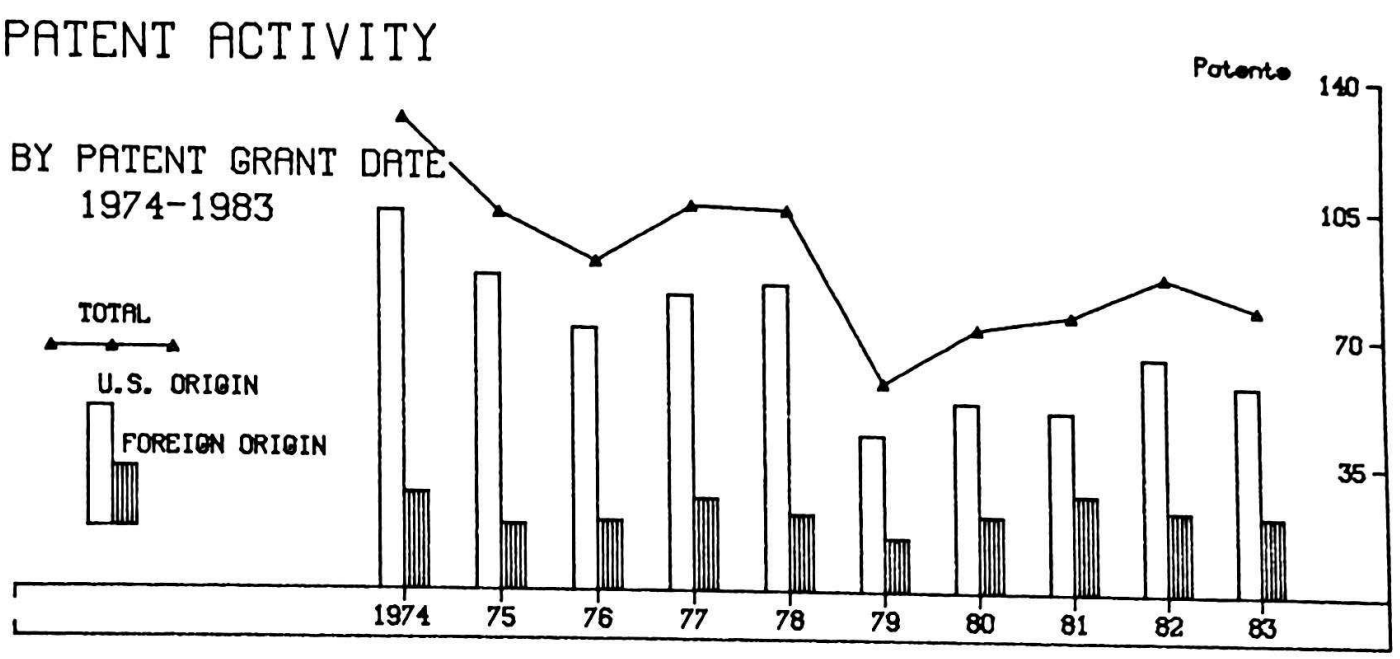
INCLUDED IN THIS PROFILE ARE ALL OF THE PATENTS FROM:

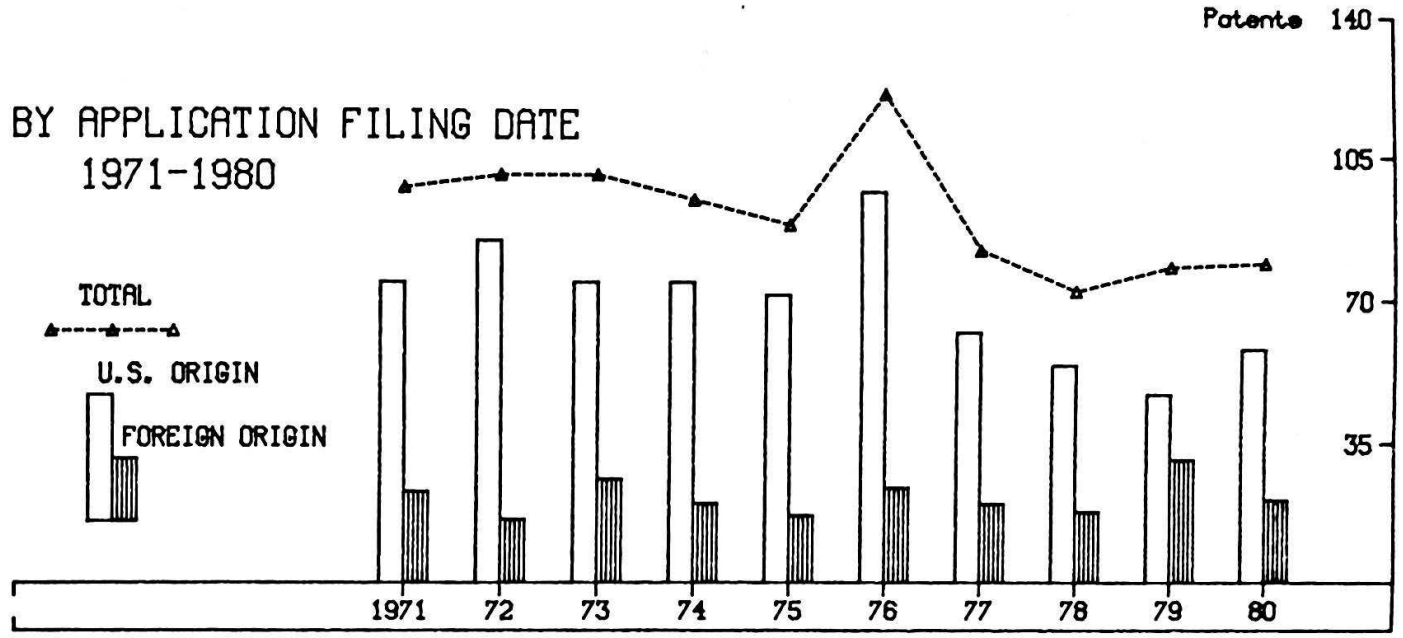
Class 33, Subclasses 267, 363R-363Y

Class 73, Subclass 146.4

Class 128, Subclasses 903, 904

Class 340, Subclasses 853-870.44





ORGANIZATIONS ASSIGNED 4 OR MORE PATENTS (1969-1983)

NO. OF PATENTS	ORGANIZATION
45	GENERAL ELECTRIC CO.
41	SCHLUMBERGER TECHNOLOGY CORP.
40	WESTINGHOUSE ELECTRIC CORP.
30	UNITED STATES OF AMERICA, NAVY
27	BENDIX CORP.
19	HONEYWELL INC.
19	UNITED STATES OF AMERICA, NASA
15	SPERRY CORP.
15	UNITED STATES OF AMERICA, ARMY
13	GENERAL MOTORS CORP.
11	FOXBORO CO.
11	HITACHI, LTD.
11	TEXACO INC.
10	DRESSER INDUSTRIES, INC.
10	ILLINOIS TOOL WORKS INC.
10	ROBERT BOSCH GMBH
9	EXXON PRODUCTION RESEARCH CO.
9	INTERNATIONAL BUSINESS MACHINES CORP.
9	RICOH CO., LTD.
9	ROCKWELL INTERNATIONAL CORP.
9	SIEMENS AG.
9	UNITED STATES OF AMERICA, AIR FORCE
8	LAITRAM CORP.
8	MCGRAW-EDISON CO.
8	MOBIL OIL CORP.
8	NIPPON SOKEN, INC.
8	ROSEMOUNT INC.
8	SHELL OIL CO.
7	UNITED TECHNOLOGIES CORP.
7	U.S. PHILIPS CORP.
6	BELL TELEPHONE LABORATORIES INC.
6	HEWLETT-PACKARD CO.
6	MEDTRONIC INC.
6	NIPPONDENSO CO., LTD.
6	NORTHERN ILLINOIS GAS CO.
6	ROBERTSHAW CONTROLS CO.
6	SUN OIL CO. OF PENNSYLVANIA
6	WESTERN GEOPHYSICAL CO. OF AMERICA
6	YOKOGAWA ELECTRIC WORKS, LTD.
5	CHEVRON RESEARCH CO.
5	FISCHER & PORTER CO.
5	LEAR SIEGLER, INC.
5	SANGAMO ELECTRIC CO.
5	SPERRY SUN, INC.
5	SUNSTRAND DATA CONTROL INC.
5	TEXAS INSTRUMENTS, INC.
4	AGA AB.
4	AMERICAN OPTICAL CORP.
4	BECKMAN INSTRUMENTS INC.
4	BURROUGHS CORP.
4	COMBUSTION ENGINEERING INC.
4	COMMISSARIAT A L'ENERGIE ATOMIQUE
4	CONOCO, INC.
4	EATON CORP.
4	E.S.B. INC.
4	HALLIBURTON CO.
4	MITSUBISHI DENKI K.K.
4	RAYTHEON CO.
4	S & C ELECTRIC CO.
4	SINGER CO.
4	SONY CORP.
4	UNITED STATES OF AMERICA, DEPT. OF ENERGY

PATENT ACTIVITY (1/63-12/83) BY DATE OF PATENT GRANT

	NUMBER OF PATENTS															
	63-69	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	803	118	142	142	111	125	100	87	102	101	55	70	74	85	77	2192
U.S. ORIGIN	672	94	115	107	89	100	83	69	78	81	41	50	48	63	56	1746
FOREIGN ORIGIN	131	24	27	35	22	25	17	18	24	20	14	20	26	22	21	446
UNITED KINGDOM	57	5	6	10	1	8	1	1	2	5	2	4	4	2	1	109
JAPAN	13	2	6	7	5	4	2	7	8	7	6	8	13	8	9	105
WEST GERMANY	14	2	3	8	4	3	3	2	5	3	1		3	6	5	62
FRANCE	15	4	6	6	6	4	1	4	4	1	1	2	1	4	1	60
SWITZERLAND	6	2	1	2		1	1	2					2		2	19
SWEDEN	4	1	2	2	1	1		1	1		1	3			1	18
CANADA	5	2			2	1	3		2				1			16
ITALY	2	1			1		1				1	1		1	1	9
NETHERLANDS	5				1					1		1				8
U.S.S.R.		3				1	1	1			1					7
FINLAND	1		1						1				2		1	6
DENMARK		1				1	2					1				5
AUSTRIA		1	2		1					1						5
BELGIUM	1						2			1						4
CZECHOSLOVAKIA	2								1	1						4
S. AFRICA	1													1		2
AUSTRALIA	1															1
EGYPT	1															1
YUGOSLAVIA											1					1
NORWAY	1															1
PERU						1										1
MEXICO	1															1
ISRAEL	1															1
U.S. ORIGIN	672	94	115	107	89	100	83	69	78	81	41	50	48	63	56	1746
U.S. CORP. OWNED	526	74	92	88	76	80	64	51	58	62	33	36	27	56	42	1365
U.S. GOVT. OWNED	49	10	13	6	2	5	7	7	6	7	1	6	4		4	127
U.S. INDIV. OWNED	96	10	10	11	11	14	12	11	12	12	7	8	16	6	10	246
FOREIGN OWNED	1			2		1			2				1	1		8
FOREIGN ORIGIN	131	24	27	35	22	25	17	18	24	20	14	20	26	22	21	446
U.S. OWNED	16	3	2	2	3	4	1	1	2	1	1	2	1	2	1	42
FOREIGN OWNED	115	21	25	33	19	21	16	17	22	19	13	18	25	20	20	404
FOREIGN CORP.	96	16	20	29	13	18	14	15	17	18	12	14	21	14	18	335
FOREIGN GOVT.	3	1	1	1	1	1			2			1		1		12
FOREIGN INDIV.	16	4	4	3	5	2	2	2	3	1	1	3	4	5	2	57

PATENT ACTIVITY (PATENTS GRANTED 1/67-12/83) BY DATE OF PATENT APPLICATION

	NUMBER OF PATENTED APPLICATIONS															
	PRE 70	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	TOTAL
TOTAL	636	114	97	100	100	94	88	120	82	72	78	79	56	4		1720
U.S. ORIGIN	517	91	74	84	74	74	71	96	62	54	47	58	44	2		1348
FOREIGN ORIGIN	119	23	23	16	26	20	17	24	20	18	31	21	12	2		372
UNITED KINGDOM	35	3	4	6	3		3	4	3	3	4	2		1		71
JAPAN	17	6	5	2	3	9	6	6	8	10	17	4	6	1		100
WEST GERMANY	14	6	3	2	3	5	3	4	1	1	2	8	2			54
FRANCE	17	5	6	3	3	3	3	2	1	1	3	3	1			51
SWITZERLAND	6	2		1	3						2	2				16
SWEDEN	5		2			1	2		3	1			1			15
CANADA	5	1	1	1	3			2	1							14
ITALY	3		1		1				1	1		1	1			9
NETHERLANDS	3			1				1			1					6
U.S.S.R.	3				2	1			1							7
FINLAND	2							1			2		1			6
DENMARK	1				3					1						5
AUSTRIA	3		1					1								5
BELGIUM					1	1		1								3
CZECHOSLOVAKIA	2							2								4
S. AFRICA												1				1
AUSTRALIA																
EGYPT																
YUGOSLAVIA									1							1
NORWAY	1															1
PERU					1											1
MEXICO	1															1
ISRAEL	1															1
U.S. ORIGIN	517	91	74	84	74	74	71	96	62	54	47	58	44	2		1348
U.S. CORP. OWNED	414	70	59	66	63	58	53	73	44	40	31	50	33	1		1055
U.S. GOVT. OWNED	45	6	4	6	2	5	6	8	7	3	4		3	1		100
U.S. INDIV. OWNED	56	14	11	11	9	10	12	14	11	11	11	7	8			185
FOREIGN OWNED	2	1		1		1		1			1	1				8
FOREIGN ORIGIN	119	23	23	16	26	20	17	24	20	18	31	21	12	2		372
U.S. OWNED	13		3	4	1	1	2	2	1	3	3					33
FOREIGN OWNED	106	23	20	12	25	19	15	22	19	15	28	21	12	2		339
FOREIGN CORP.	87	21	14	10	21	17	13	19	18	11	22	16	11	2		282
FOREIGN GOVT.	3		1	1			1	1		1		1				9
FOREIGN INDIV.	16	2	5	1	4	2	1	2	1	3	6	4	1			48

7.0 TELEMETRY

REFERENCES CITED

During the examination of an application for a patent in the United States Patent and Trademark Office, references may be cited by the examiner and/or the applicant to indicate the prior art which is most closely related to the claimed invention. Other references may be cited merely to demonstrate the current state of the art. The information below is based on the references made of record during the examination of U.S. applications which were issued as patents in the subject technology during the period 1975-1983.

TOTAL PATENTS ISSUED (1975-1983)	751
TOTAL REFERENCES CITED	5037
U.S. Patent References Cited	4641
Foreign Patent References Cited	178
Other References Cited	218

COUNTRY OF ORIGIN OF U.S. PATENT REFERENCES CITED*	NUMBER OF CITATIONS
U.S.	3147
Japan	192
West Germany	138
United Kingdom	134
France	102

MOST FREQUENTLY CITED U.S. PATENTS, ASSIGNEE	NUMBER OF CITATIONS
3,702,467, International Business Machines Corp.	13
3,961,318, Inductosyn Corp.	12
3,426,150, Lockheed Corp.	11
3,786,423, Northern Illinois Gas Co.	10
3,742,473, Unassigned	10

MOST FREQUENTLY CITED ASSIGNEES**	NUMBER OF CITATIONS
General Electric Co.	87
Westinghouse Electric Co.	58
International Business Machines Corp.	51
Schlumberger Technology Corp.	48
Honeywell Inc.	42

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*Country of Origin information is limited to U.S. patent references issued from 1963-1983.
**Assignee information is limited to U.S. patent references issued from 1969-1983.

APPENDICES

APPENDIX A

EXPLANATORY NOTES AND DATA TABLES

Patented Application Data

Patented application data are obtained by taking all patents which issued between 1967 and 1983, and distributing them by the year when the applications were filed in the PTO. Patents which were granted prior to 1967 are not included since the application date information for these patents is not in the data base. Also, applications which were filed but never issued (roughly 30% of the total filings), as well as those applications which were still pending as of December 31, 1983, are not included. Thus, only those applications which were filed and subsequently became patents, with patent grant dates between 1967 and 1983, are included.

While the length of time between the patent application date and the patent grant date varies from patent to patent, the current average pendency is in excess of 24 months. Many applications filed in 1981, 1982, and 1983 were still pending at the end of 1983. Thus, patented application data for these years are incomplete. While a small number of applications which were filed prior to 1981 were still pending, the patented application data prior to January 1981 are essentially complete.

Patented application data reflect only patents in the data base. Thus, in the patented application tables used in this report, the column "pre-70" does not include all applications filed before 1970 but only those patented applications which became patents between 1967 and 1983.

The graph of patented applications information in each profile is limited to the years 1971-1980, years for which the data are essentially complete. Thus, the graphs are accurate representations of activity based on the application dates of patents, i.e., patented applications.

Assignee

The term "assignee" refers to a corporation, organization or individual to whom an inventor's rights to a patent are assigned at the time of patent issue. Changes in assignment, name changes and/or mergers which occur after the patent is granted are not recorded in the OTAF data base. Approximately 80% of all U.S. patents are assigned when granted, mostly to corporations.

The number of patents attributed to a given assignee in this publication may occasionally vary from actual numbers because of alternative name forms or random spelling errors in the data base (e.g., General Motors, General Motors Corp., GM Corporation). Where possible, OTAF merges alternative name forms and corrects spelling errors. However, not all errors are easily identified and it is not always clear whether alternative names refer to the same organization.

Table A-1

U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS BY YEAR OF PATENT GRANT 1963-1983

YEAR	TOTAL	U.S. ORIGIN	FOREIGN ORIGIN
1963	1,254	1,038	216
1964	1,354	1,134	220
1965	1,914	1,591	323
1966	2,075	1,651	424
1967	1,968	1,527	441
1968	1,609	1,235	374
1969	2,183	1,646	537
1970	2,535	1,887	648
1971	3,141	2,269	872
1972	2,687	1,927	760
1973	2,695	1,861	834
1974	2,609	1,799	810
1975	2,557	1,682	875
1976	2,611	1,639	972
1977	2,701	1,678	1,023
1978	2,499	1,543	956
1979	1,878	1,133	745
1980	2,487	1,430	1,057
1981	2,538	1,430	1,108
1982	2,540	1,370	1,170
1983	2,544	1,431	1,113

Table A-2

U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS BY YEAR OF PATENTED APPLICATION 1970-1980

	PATENTED APPLICATIONS		
YEAR	TOTAL	U.S. ORIGIN	FOREIGN ORIGIN
1970	2,239	1,610	629
1971	2,289	1,583	706
1972	2,345	1,596	749
1973	2,356	1,522	834
1974	2,475	1,558	917
1975	2,566	1,635	931
1976	2,615	1,627	988
1977	2,563	1,551	1,012
1978	2,627	1,510	1,117
1979	2,704	1,511	1,193
1980	2,861	1,545	1,316

Table A-3

U.S. PATENT ACTIVITY IN TELECOMMUNICATIONS AS A PERCENTAGE OF ACTIVITY IN ALL TECHNOLOGIES BY YEAR OF PATENTED APPLICATION
1970-1980

	NUMBER OF PATENTED APPLICATIONS		
YEAR	TELECOMMUNICATIONS	ALL TECHNOLOGIES	TELE ÷ ALL TECH x 100
1970	2,239	65,944	3.40%
1971	2,289	66,358	3.45%
1972	2,345	66,360	3.70%
1973	2,356	66,286	3.55%
1974	2,475	66,385	3.73%
1975	2,566	65,821	3.90%
1976	2,615	65,715	3.98%
1977	2,563	65,791	3.90%
1978	2,627	65,141	4.03%
1979	2,704	64,539	4.19%
1980	2,861	62,739	4.56%

Table A-4

U.S. TELECOMMUNICATIONS PATENTS GRANTED TO RESIDENTS OF JAPAN, WEST GERMANY, THE UNITED KINGDOM, AND FRANCE
1963-1983

YEAR	JAPAN	WEST GERMANY	UNITED KINGDOM	FRANCE
1963	19	35	77	15
1964	22	33	63	19
1965	26	64	97	33
1966	51	109	105	39
1967	72	104	86	56
1968	60	93	74	35
1969	93	122	109	59
1970	117	150	97	70
1971	209	138	158	113
1972	220	134	113	84
1973	269	154	93	105
1974	299	118	96	94
1975	349	134	120	92
1976	366	136	135	114
1977	397	157	124	116
1978	377	136	132	98
1979	311	123	83	81
1980	456	155	119	137
1981	492	162	110	117
1982	521	169	106	144
1983	530	177	88	117

Table A-5

COUNTRIES OF ORIGIN OF U.S. PATENTS IN SEVEN AREAS OF TELECOMMUNICATIONS
1971-1973 vs 1981-1983

	NUMBER OF PATENTS	
	1971-1973	1981-1983
1.0 Telephony	1899	1609
United States	1300	978
Japan	122	262
West Germany	92	78
United Kingdom	74	38
Other Foreign	329	253
2.0 Light Wave Communications	888	1055
United States	676	543
Japan	93	179
West Germany	38	103
United Kingdom	25	61
Other Foreign	56	169
3.0 Multiplex Communications (Excluding Light Wave)	647	780
United States	394	409
Japan	69	118
France	36	70
West Germany	34	63
Other Foreign	114	120
4.0 Analog Carrier Wave Communications	1242	1134
United States	951	652
Japan	107	280
West Germany	43	58
United Kingdom	35	38
Other Foreign	291	106
5.0 Digital & Pulse Communications	2401	1682
United States	1736	1009
Japan	141	241
West Germany	119	118
United Kingdom	128	80
Other Foreign	277	234
6.0 Television & Facsimile	2065	2281
United States	1417	1171
Japan	236	632
West Germany	118	150
United Kingdom	98	92
Other Foreign	196	236
7.0 Telemetry	395	236
United States	311	167
Japan	18	30
West Germany	15	14
United Kingdom	17	7
Other Foreign	34	18

APPENDIX B

PUBLICATIONS BY THE OFFICE OF TECHNOLOGY ASSESSMENT AND FORECAST

OTAF publications -- PATENT PROFILES, Technology Assessment and Forecast Reports, and others -- are described below. They may be purchased from the National Technical Information Service (NTIS) or the Government Printing Office (GPO). Table B-1 presents information for ordering these publications.

PATENT PROFILES

- PATENT PROFILES - Biotechnology: 1982 Update (September 1983) profiles the patenting activity in six areas of biotechnology involving enzymes and microorganisms, their use in the synthesis of certain products, and their preparation or modification. It includes an analysis of legal decisions which have affected the patenting of biotechnology processes and products. It lists recent foreign patent documents which disclose genetic engineering, and includes front pages of recent patents and selected patents of interest. This publication includes a section which updates through 1982 the six biotechnology areas profiled in PATENT PROFILES - Biotechnology.

- PATENT PROFILES - Microelectronics - II (January 1983) is the second in the series of profiles on microelectronics, and covers two additional areas of the technology -- Digital Logic Circuits and Semiconductor Memories. A third section -- Speech Analysis and Synthesis -- examines an area dealing with a practical application of microelectronics technology. It includes front pages of 30 patents and briefly describes their particular significance in the art. Also, it provides an analysis of organizational patenting patterns.

- PATENT PROFILES - Microelectronics - I (February 1981) profiles the patenting activity in two representative segments of microelectronics technology relating to integrated circuit structure and information processing devices, e.g., "CPU's." For patents issuing from January to October 1980, it includes front pages which show bibliographic information, an abstract of the disclosure, and a representative drawing. It also includes information about references cited during the examination period.

- PATENT PROFILES - Solar Energy (January 1980) profiles the patenting activity in five areas of technology which use energy provided by the sun and in three areas which use energy derived from other natural sources, such as wind, tide, wave, and geothermal. A cumulative profile of the five solar areas illustrates the dramatic growth in this field.

- PATENT PROFILES - Synthetic Fuels (December 1979) profiles the patenting activity in ten areas of synthetic fuel technology dealing with the conversion of solid carbonaceous material to liquid or gaseous hydrocarbons. Starting materials include coal, oil shale, bituminous sands, wood and organic wastes.

Technology Assessment and Forecast Reports

- Tenth Report (November 1981) updates the "Top 50" most active technologies introduced in the Ninth Report. It reviews the U.S. patent activity of some of the largest European and Japanese foreign multinational corporations -- over time, across technology and relative to one another. It provides an extensive review of the changing standards for computer software patentability, including the 1981 Supreme Court decision, and examines the impacts of such changes on a representative technology -- seismic data processing. It demonstrates, using aerospace technology patenting as an example, how the patent file can be used as a source for historical, technical or bibliographic data.

- Ninth Report (March 1979) presents "Top 50" most active technologies in three categories -- Most Active, Fastest Growing, and Most Foreign-Active -- for each of three broad groupings of technology -- Chemical, Electrical and Mechanical. It examines trends in domestic patenting and independent inventor patenting. It includes an extensive review of patenting in "Ferrous Metal" technologies. It concludes with a discussion of two experiments in the transfer of "appropriate technology" to small businesses and developing countries.

- Eighth Report (December 1977) reviews U.S. patenting in the context of domestic vs. international patenting and analyzes the balance of patenting between the United States and other countries. It presents an analysis of the extent of disclosure of patented technology in the nonpatent literature, showing that much of patented technology is only disclosed in the patent literature. This report concludes with an in-depth analysis of patent activity in geophysical exploration for hydrocarbons.

- Seventh Report (March 1977) reviews historical patenting and trademark registration trends, and includes the most extensive collection of historical U.S. patent data ever presented in a single publication. It uses data relating to patents granted by foreign nations for a study of invention sources. It uses pending patent application data for forecasting. It presents brief reviews of 16 technologies experiencing high overall or foreign patent activity. It concludes with a comprehensive assessment of activity in computer memories.

- Sixth Report (June 1976) reviews 15 technologies with unusually high foreign activity and 22 technologies with high overall activity. It updates the 1973 reports on patent activity in solar energy, and adds reports on the use of waste material or wind for energy generation. It presents comparisons of patenting to R&D expenditures and R&D manpower allocations in six selected industries. The report concludes with a review of the six most often cited patents in 1975, five U.S. and one foreign patent.

- Fifth Report (August 1975) reviews 60 technological areas, not previously reported on, experiencing a high level of overall activity or of foreign activity. It presents patent activity data in categories corresponding to 36 Product Fields of the Standard Industrial Classification System.

- Fourth Report: A Review of Patent Ownership (January 1975) identifies the 73 corporations and government agencies which received 500 or more patents during the five year period 1969-1973, and reviews and compares their patent activity across the spectrum of technology. It also reviews in terms of patent ownership, the patent activity during the same period in nuclear energy technology and oil shale and coal gasification technology.

- Third Report (June 1974) presents an overview of the technological activity, across all technologies, of a group of selected foreign countries and a group of selected U.S. states. It extends energy area treatments to include oil shale and coal gasification technologies. It also reviews additional technological areas having a high level of overall activity.

- Early Warning Report (December 1973) spotlights those technological areas experiencing a high level of overall activity or of foreign activity. It reviews patent activity in a number of energy areas, including nuclear, solar, geothermal, and tide, wind and wave energy.

- Initial Publication (May 1973) describes OTAF programs and gives sample reports on 24 wide-ranging areas of technology in varying levels of detail.

Other Publications

- DESIGN PATENTS (1983) compiles all available statistics on design patents granted in the United States. It analyzes trends, and identifies the origins and ownership of U.S. design patents. It also profiles major divisions within the design patent file, and identifies most active design areas. It includes selected patent front pages from each class in the Design Classification System.

- Industrial Robots: A Survey of Foreign and Domestic U.S. Patents (August 1982) analyzes 212 U.S. patents disclosing industrial robot technology, including control and positioning, programming and motion systems, sensors, and grippers. It includes patent front pages and the first pages of the specification, arranged by technology. It discusses countries and companies most active in U.S. patenting of robotics. It includes microfiche containing the full text of 212 robot patents.

- Industrial Patent Activity in the United States, Parts 1 and 2 (April 1984) This two-part publication gives information about the activity, ownership and national origin of patents granted by the U.S. Patent and Trademark Office. It identifies those U.S. and foreign organizations, e.g., corporations, government agencies and universities, which have been most active in the U.S. Patent System during the years 1969-1983. Yearly updates of this publication are expected. Each part, described below, may be purchased separately.

- Industrial Patent Activity in the United States, Part 1 - Time Series Profile by Company and Country of Origin, 1969-1983 (April 1984) shows the relative levels of patenting by all nations active in the U.S. Patent System and gives yearly counts of patents attributed to corporate, government and unaffiliated, e.g., "independent" inventors. It identifies companies having 10 or more patents in the 1969-1983 period, and ranks them in terms of total 15-year patent receipts. Patent activity for each year is profiled by both patent grant date and patented application filing date.

- Industrial Patent Activity in the United States, Part 2 - Alphabetical Listing by Company, 1969-1983 (April 1984) is an alphabetical list of more than 20,000 U.S. and foreign organizations receiving at least three patents during the period 1969-1983. Included for each organization is the total patent count for the 15-year period.

Microfiche

Telecommunications - PATENT PROFILES, Microfiche Supplement (August 1984) contains the patent numbers of all patents included in PATENT PROFILES - Telecommunications, separated according to technology area. It gives the titles for all patents granted since 1969. Patents assigned to organizations are grouped by organization (assignee) name. Other patents are grouped by name of inventor or individual assignee. For unassigned patents, the full address of each inventor is included.

Ordering OTAF Publications

Table B-1 "How To Order OTAF Publications" lists all the OTAF publications available from the National Technical Information Service (NTIS) and the U.S. Government Printing Office (GPO). Reports are also available from NTIS in microfiche.

* * * *

HOW TO ORDER OTAF PUBLICATIONS

Copies of the OTAF publications listed below are available from:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650

Supt. of Documents
U.S. Govt. Printing Ofc. (GPO)
Washington, D.C. 20402
(202) 783-3238

TITLE	DATE	NTIS ORDER NUMBER*	DOMESTIC PRICE**	FOREIGN PRICE	GPO ORDER NUMBER	GPO PRICE
Initial Publication	1973	COM 73-10767	$13.00	$ 26.00		
Early Warning Report	1973	COM 74-10150	23.50	47.00		
Third Report	1974	COM 74-11383	17.50	35.00		
Fourth Report: A Review of Patent Ownership	1975	COM 75-10050	14.50	29.00		
Fifth Report	1975	COM 75-11142	16.00	32.00		
Sixth Report	1976	PB 254188	17.50	35.00		
Seventh Report	1977	PB 265792	19.00	38.00	003-004-00542-4	$7.00
Eighth Report	1977	PB 276375	14.50	29.00		
Ninth Report	1979	PB 293380	17.50	35.00	003-004-00559-9	7.00
Tenth Report	1981	PB 82-215658	17.50	35.00	003-004-00580-7	7.00
PATENT PROFILES - Synthetic Fuels	1979	PB 80-128572	6.50	13.50	003-004-00566-1	7.00
PATENT PROFILES - Solar Energy	1980	PB 80-190010	6.50	13.50	003-004-00568-8	7.00
PATENT PROFILES - Microelectronics-I	1981	PB 81-179582	8.50	17.00		
PATENT PROFILES - Microelectronics-II	1983	PB 83-132613	15.50	31.00	003-004-00595-5	6.50
PATENT PROFILES - Biotechnology: 1982 Update	1983	PB 83-240937	15.50	31.00	003-004-00599-8	7.00
PATENT PROFILES - Telecommunications	1984	PB 84-211044	6.50	13.50		
Telecommunications - PATENT PROFILES, Microfiche Supplement	1984	PB 84-211051	7.50	15.50		
Industrial Patent Activity in the United States, Part 1 & 2	1984	PB 84-171149	40.50	81.50		
Part 1 - Time Series Profile by Company & Country of Origin, 1969-1983	1984	PB 84-171156	25.50	51.50		
Part 2 - Alphabetical Listing by Company, 1969-1983	1984	PB 84-171164	19.50	39.50		
Design Patents	1983	PB 83-224063	15.50	31.50	003-004-00603-0	8.50
Industrial Robots: A Survey of Foreign & Domestic U.S. Patents	1982	PB 82-169269	95.00	190.00		
NTIS Microfiche of Selected Publications			varies	varies		

*When ordering from NTIS, please give the publication title and its "COM" or "PB" number.
**Domestic prices are for orders from the U.S., Canada and Mexico.

NOTE: Prices are subject to change.

APPENDIX C

PROGRAMS AND SERVICES OF THE OFFICE OF TECHNOLOGY ASSESSMENT AND FORECAST

Background

The Office of Technology Assessment and Forecast (OTAF) is part of the U.S. Patent and Trademark Office. One of its principal functions is to stimulate the use and enhance the usability of the more than 25 million documents which make up the categorized U.S. patent file. In carrying out this mission, OTAF has assembled a master data base which covers all U.S. patents.

OTAF extracts meaningful information about the U.S. patent file from its data base, analyzes the information and makes it available in a variety of formats to patent attorneys, researchers, PTO employees, government agencies and other users.

OTAF disseminates patent information through the following:

- OTAF PUBLICATIONS which are described in Appendix B.

- CUSTOM PATENT REPORTS which are generated by computer and prepared in response to specific requests. These are provided on a cost-reimbursable basis and include a variety of standard format reports as well as specially tailored reports.

- STATISTICAL REPORTS which include all patents in the data base and show yearly levels of patenting distributed by state or country of origin, category of ownership and technology class within the U.S. Patent Classification (USPC) System. These, as well as samples of standard format reports, are available from OTAF upon request.

Information in the Data Base

OTAF's computerized base of data relating to the U.S. patent file includes, at present:

- all subclasses of the U.S. Patent Classification (USPC) System, and the classification within this System of all U.S. patents, including utility and design patents.

- the relationship of all utility subclasses in the U.S. Patent Classification System to 55 Product Fields and combinations of Product Fields in the Standard Industrial Classification (SIC) System.

- the category of ownership at time of issue, e.g., U.S. government, foreign government, U.S. corporation, foreign corporation, U.S. individual, foreign individual (for utility patents issued since 1963 and for design patents issued since 1977).

- the country or state of residence of the inventor (for utility patents issued since 1963 and for design patents issued since 1977).

- the date the application for patent was filed in the United States (for utility patents issued since 1967 and for design patents issued since 1977).

- the specific (i.e., named) ownership of all patents which, at time of issue, were owned by an organization (for utility patents issued since 1969 and for design patents issued since 1977).

- the patent title (for utility patents issued since 1969 and for design patents issued since 1977).

- the name and address of inventors of unassigned patents (for utility patents issued since 1975 and for design patents issued since 1977).

- the field of search and references cited in the examination leading to the patent grant (for utility patents issued since 1975 and for design patents issued since 1977).

Custom Patent Reports

Data can be retrieved on the basis of any one or any combination of the elements contained in the data base, manipulated on most any given basis and presented in a number of formats, e.g., lists, tables, graphs, and charts. This flexibility is illustrated in the variety of standard format custom reports offered by OTAF, and described below. Samples of standard format reports are available from OTAF upon request.

Technology Profile Report. There are four parts (Parts A, B, C, & D) to this report. Part A includes patenting activity percentages and time-series distribution by general assignment category and origin of patents. Part B is a ranked listing of organizations which shows counts of patents granted by both year of application filing and grant date. Part C lists organizations alphabetically showing patent numbers and titles. Part D gives the name and address of the inventors of patents assigned to individuals or unassigned at time of issue, and includes patent numbers and titles.

Organizational Profile Report. This report profiles patent activity, usually of a specified organization, across all of the classes and subclasses of the USPC System, and gives specific patent numbers and titles. Users may limit reports to specific classifications. OTAF can prepare this report on the patents of any organization or grouping of organizations, or on the patents granted to the residents of any state or country or grouping of states or countries.

Multi-Corporate Patent Activity Profile. In this report, patenting patterns across the USPC classes and subclasses of up to eight organizations are profiled simultaneously, facilitating comparisons between organizations. Unlike the Organizational Profile, no patent numbers or patent titles are given.

Enterprise Patenting Report. This report gives the count of patents per year per USPC class for a parent company and its patenting subsidiaries. An optional part of this report lists all of the organizations considered under the enterprise name and indicates the total number of patents held by each of them.

Other Standard Format Reports. OTAF has developed the flexibility to prepare other standard format reports designed to meet the needs of a large number of users. These include:

- Reports based on Standard Industrial Classification (SIC) Product Fields for which a concordance exists with utility subclasses of the USPC System. Custom patent reports, such as the Technology Profile Report, can be prepared for any of these Product Fields.

- Corporate Patenting Reports where patents of the designated organization are given in numerical order.

- Citation Reports which include, for a designated classification or group of classifications, the number and origin of the references cited during the examination period leading to the grant of the patent, the U.S. references most frequently cited and the owner (assignee) of patents most frequently cited.

- Mailing Label Reports showing the name and address of inventors of unassigned patents.

How to Obtain OTAF Custom Reports

Contact OTAF to discuss the type of information you need. OTAF will assist you in determining the report content and format that best suits your needs, and provide you with a free estimate of its cost. If the terms are acceptable to you, the report will be prepared and forwarded to you, usually within seven working days.

All Custom Reports are provided on a cost-reimbursable basis and billed through the National Technical Information Service. The costs may vary widely — from as low as $75.00 for some standard format reports, to several thousand dollars for complex or large-scale treatments. The preparation of specially tailored reports, requiring extensive professional time, programming and/or computer time, is subject to the availability of OTAF resources.

Statistical Reports

The following items may be obtained from OTAF upon request, at no charge.

- ALL TECHNOLOGIES REPORT -- Part A of this report shows the number of patents granted each year for the most recent 14-year period. The totals are broken down by origin, either U.S. or foreign, and yearly counts are shown for the 35 foreign countries having the most U.S. patents during the period. Totals are also divided according to general category of ownership, e.g., corporate-owned, government-owned. Percentages corresponding to the totals in each category are given.

  Part B of this report shows the national and international corporations, government agencies and other organizations which have received 1200 or more patents since 1969. It ranks these organizations in terms of total patent receipts and profiles their patenting activity for each year during the time period examined.

- STATE/COUNTRY REPORT -- This report divides the yearly totals of U.S. patents according to the state or country of origin. All countries active in the U.S. Patent System are identified, and the level of patenting by each is shown.

- COUNTS BY CLASS BY YEAR REPORT -- This report shows the number of patents granted each year in each of the approximately 350 U.S. patent classes, the primary division of technology within the U.S. Patent Classification System.

- INDEPENDENT INVENTOR COUNT REPORT -- This report shows the number of "independent inventors" by state for the years 1975 to the present. Independent inventors are the inventors of those patents which are either unassigned or assigned to individuals at time of patent grant.

- SAMPLE REPORTS -- OTAF has prepared samples of many of the most popular standard format reports. Copies of these sample reports, listed below, are available upon request:

  -- Technology Profile Report on Pacemakers
  -- Organizational Profile Report on Atlantic Research Co.
  -- Enterprise Patenting Report on AT&T
  -- Multicorporate Profile Report on AT&T, Bell Telephone Laboratories Inc., Western Electric, and Teletype (selected pages)
  -- Citation Report on Semiconductor Memories.

For additional information about OTAF publications and services, please call or write:

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APPENDIX D

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